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AMAZING ATOM-POWERED TRAINS
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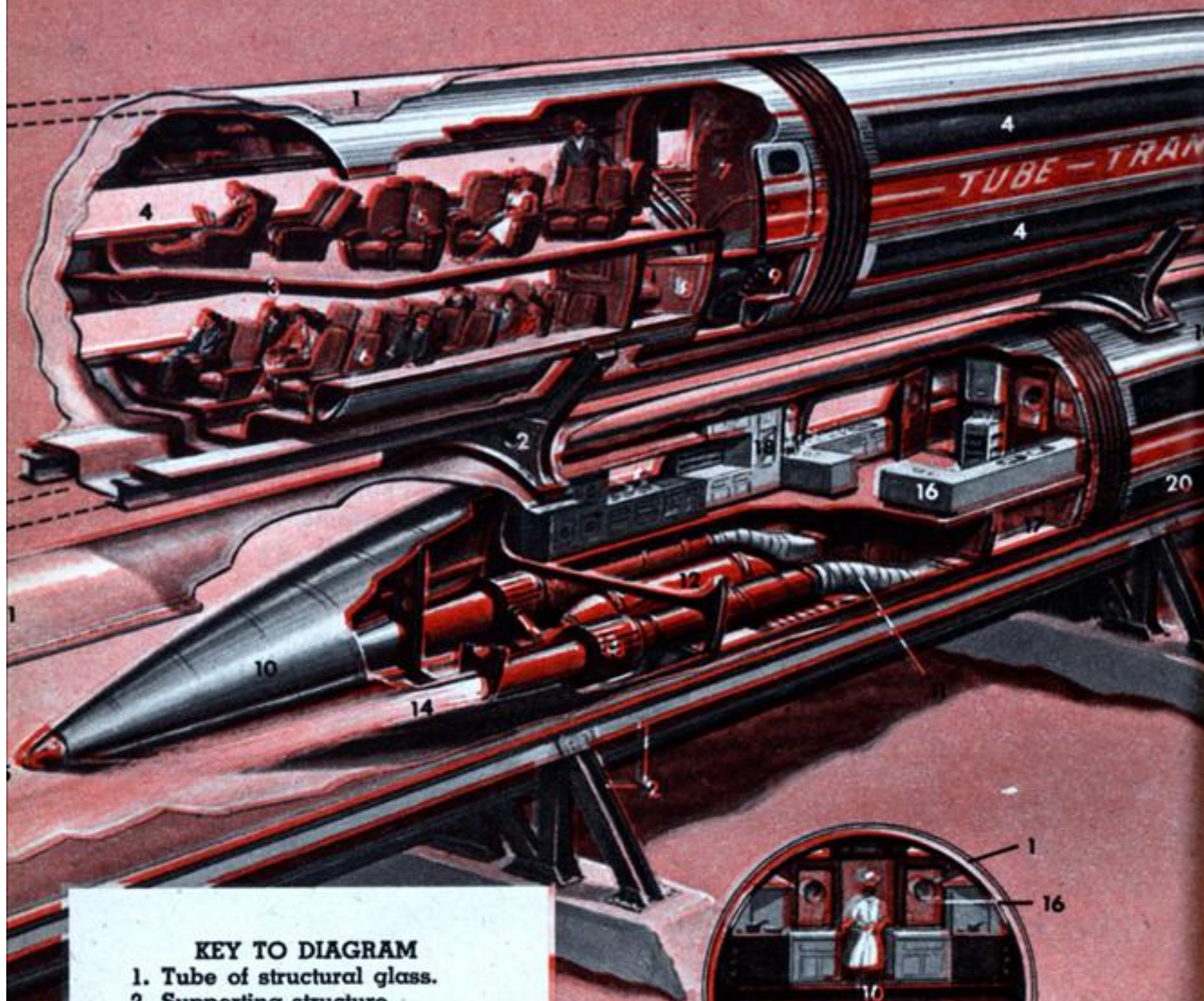
See Page 62



FRANK TINSLEY

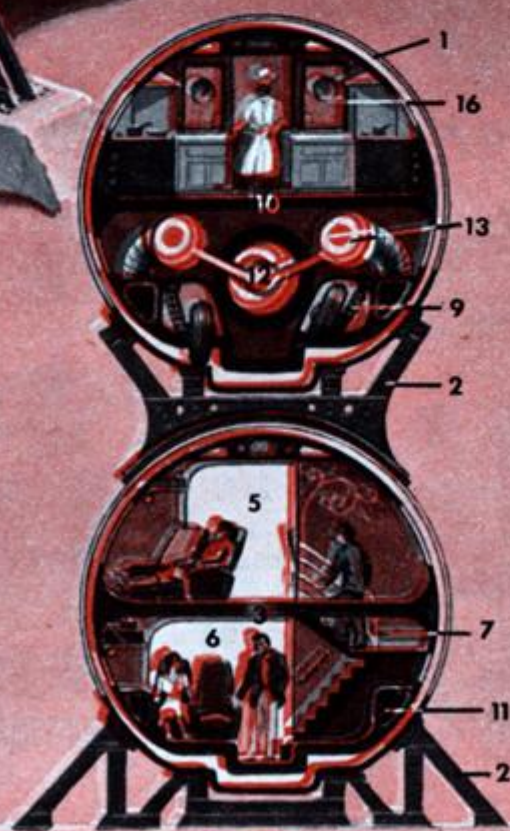
NOW YOU CAN HIRE INVENTOR
PREVIEW OF THE 1957 NATION

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KEY TO DIAGRAM

1. Tube of structural glass.
2. Supporting structure.
3. Passenger car accommodations.
4. Continuous strip windows.
5. Extra-fare parlor car.
6. Regular fare seating.
7. Mid-line entry platforms.
8. Lavatory.
9. Auto-type wheels, retracted.
10. Power plant in tail unit.
11. Air ducts to engine intakes.
12. Atomic pile, heat exchanger.
13. Heating fluid, ducted to the "combustion chamber," expands compressed air.
14. Air exhaust nozzles.
15. Tail light.
16. Dining car kitchen, pantry.
17. Grill car pantry below.
18. Connecting dumbwaiter.
19. First class dining car.
20. Lower cost grill car.



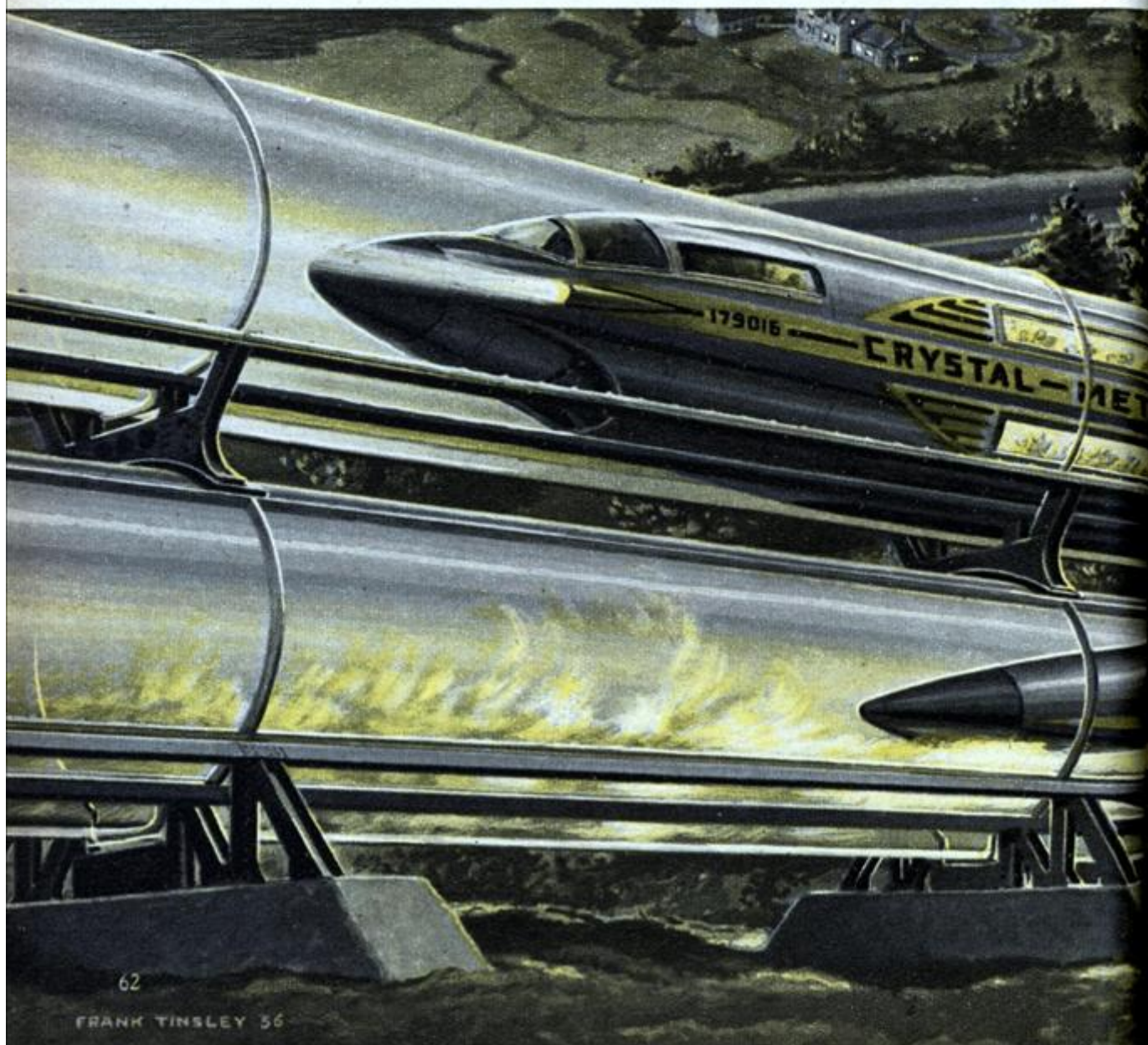
AMAZING
MARVELS
OF TOMORROW

A-POWERED TRAINS

*They'll give airliner speeds
plus weather-free reliability.*

By Frank Tinsley

THE train of the future, whipping passengers vast distances through continent-girdling tubes at speeds and in comfort far surpassing that of modern air travel, is no longer merely a dream in the minds of our more imaginative



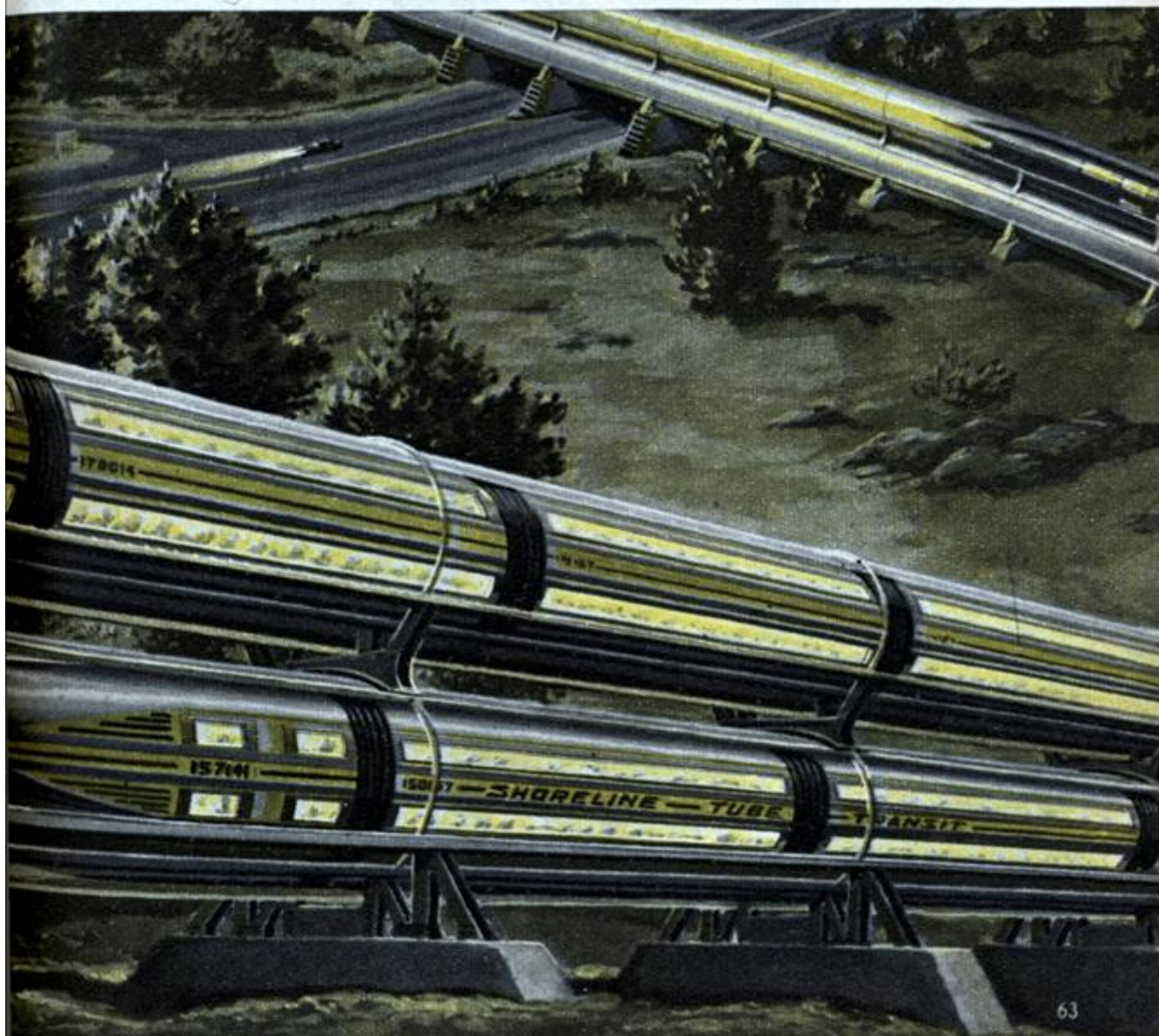


IN GLASS TUBES

designers and engineers. This old idea (New York's first working subway train was sucked through a tube) has been brought well within the realm of probability—and the hero of this advance is, as has so often been the case in the his-

tory of technology, a new material.

A crude form of this material has been serving man since the dawn of history. Glass, commonly thought of as that brittle stuff that boys like to smash with baseballs and slingshots, is in this gen-



eration being brought to such strength, lightness and flexibility that the glass industry is now looking toward a new era, not so far off, when bridges, buildings and car bodies will be built of glass that is stronger and lighter than steel. And from Oscar G. Burch, Vice President in charge of research for the Owens-Illinois Glass Company, a very sound and serious-minded engineer, comes the word that the tubed train may some day take over the long haul business.

Long distance trains, according to Mr. Burch, may abandon today's exposed tracks and rocket across country in glass tubes, propelled at airplane speeds by compressed air. He also envisions glass-sheathed spaceships and entire cities built beneath air-conditioned domes of lens-clear crystal. So far, says Mr. Burch, we have achieved a paltry one per cent of the theoretical strength and use potential of glass. As small an increase as ten per cent will be ample to turn his seemingly bizarre predictions into solid actuality!

As far as we know, however, Burch's test-tube railroad is an entirely new concept, and one which intrigues your editors. We have pondered its engineering problems and possibilities and herewith present our own preview of tomorrow's transparent trains.

First of all, it must be emphasized that MI's tubular train will *not* replace today's open-face local and commuter services. It is intended, rather, to complement these by adding airplane speeds to long distance railway runs. The possibilities of its fast, round-the-clock service, unchecked by snow or storm, should reverse present trends in passenger travel and give the airlines a real run for their money. Zipping through its glass sheath from New York to Florida or coast-to-coast at 300 mph or better, our crystal flyer can combine the distance-devouring zoom of aerial flight with the safety and comfort of surface travel.

While conceding the practicability of structural glass for tubular railroad tracks, we could not however, go along with Mr. Burch's method of propulsion. The use of compressed air, we felt, in-

volves too many problems of generation and control. A string of power stations would have to be spaced along the line to evacuate the tube ahead of the train and build up propulsive pressures behind it. In addition to the expense and complication, this system would limit the operating headway by preventing trains from following one another at reasonably frequent intervals.

There was also some question as to the public's willingness to be shot along in devices not under direct human control. Your editors concluded therefore, that each individual train should be driven by an engineer and propelled by a self-contained powerplant capable of controlling the pressures generated by its passage through a closed tube.

The most obvious answer to these specifications is the jet engine. With an airplane-type nose intake, this could suck in air from in front of the train and blow it out behind. By thus creating a partial vacuum ahead and pressure astern, our jet could either raise the speed or reduce the power requirement with a consequent increase in the vehicle's overall efficiency.

There is, however, a serious objection to the conventional jet engine operating on a petroleum-base fuel. It expands the working fluid—air—by mixed combustion and the gases expelled from its tail-pipe would soon taint the air in the tube. Succeeding trains would rapidly concentrate the carbon monoxide content to a poisonous level. Therefore, the standard chemical fuels were out. We had to find a heat source which could expand the working air without contaminating it. In this atomic age we had not far to look.

The new type of atomic heat generation unit in which the reactor core is surrounded by a built-in heat exchanger and the whole encased in composite shielding, will eventually be light and compact enough for locomotive use. This is the plant for our tubular train. From it, molten sodium is piped through shielded ducts to a cylindrical heat transmitter enveloping the jet engine's "combustion chamber."

Compressed air entering the chamber is heated and expanded without

coming into physical contact with the sodium. It then blows out the tail-pipe as clean as it came in. This operating air, as previously noted, has been drawn into an intake beneath the nose of the leading unit and carried the length of the train through ducts built into the lower sides of each car. Between the cars, flexible connectors—larger versions of today's air brake hoses—span the coupling gaps.

Upon reaching the rear power unit, the air flows into twin jet engines mounted on either side of the reactor. There it is compressed, expanded by atomic heat and ejected rearward to produce the propelling thrust.

MI's train differs radically from today's iron horse in that its wheels and tracks are used only at low speeds and stops and function chiefly as a landing gear. While loading and unloading in a station, the wheels are lowered to bear the weight of the train. After starting, they continue to carry the weight to a diminishing degree as the train moves forward. During this gradual acceleration, the air ahead of the train is compressed to an increasing degree and forced to flow backward around the cars through the space between the trains outer surface and the tube's inner wall.

When the train reaches a certain speed, this surrounding layer is compressed to a point where it supports the vehicle's weight. Thereafter, the train retracts its wheels and literally "flies" through the tube like an airplane test model in a wind tunnel. Having no "hot box" wheel bearings or track forces to consider, airline speeds are easily attainable.

In designing the train itself, your editors drew liberally from ACF Industries' high speed Talgo Train. With an unusually low center of gravity, short, close-coupled car units and steerable, automobile-type wheels, the lightweight Talgo can snake around turns at 80 mph or more. All these characteristics are essential to tube transit, where smooth-surfaced curvability is a must. About the only mechanical changes necessary were to make the wheels retractable and provide a bottom "keel" to prevent lateral rotation within the tube. Like

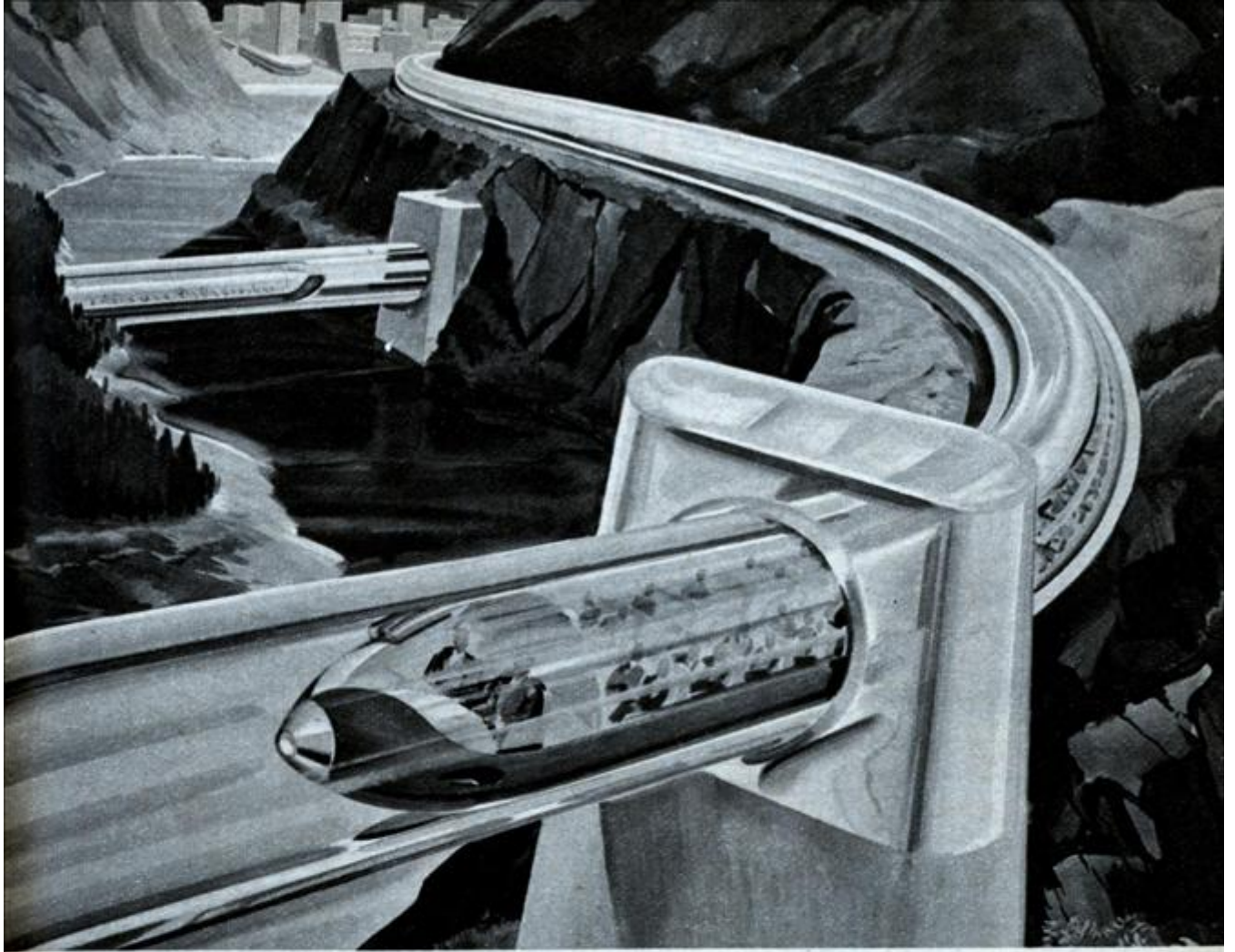
the Talgo, the basic MI car is 60 feet long, broken into three articulated units. Each unit is equipped with one pair of rear wheels, its forward end pivoting on the pair ahead like the body of a trailer truck.

Here, however, the Talgo resemblance ends. Circular in section except for the bottom keel, MI's cars are double-decked to gain floor space and make maximum use of interior space. The vestibule platforms and doors are set midway between the levels, with short stairways leading up and down to the two decks. They are designed so that the platforms rest on top of the wheel wells, thus conserving space. There is an adjoining lavatory on the lower level.

In line with the latest trend in air travel, the cars are divided into two price classes. The lower deck offers coach service with a maximum-capacity arrangement of forward facing seats in conventional railway style. They are ultra-modern, individually tilting chairs with adequate leg room, set one step above a sunken central aisle. Windows are the continuous-strip type of steel-strong, structural glass and form the side panels of the car. Above are individual reading lights and racks for luggage and clothing.

The upper deck features deluxe, chair-car accommodations which like its present railroad counterpart, is a reserved, extra-fare service. Paired seats are placed diagonally to fully exploit the vista-dome windows. They are set far enough apart to permit full reclining position for night runs. The triangular floor areas on each side enable the traveler to enter or leave without disturbing his seatmate. Porter or hostess service will be provided.

The first-class diner is on the upper level of the unit adjoining the rear power car, with a capacious kitchen and pantry positioned above the engine room. The atomic heat which drives the train and generates its auxiliary electric power, may also be tapped for cooking. A dumbwaiter connects the upper pantry with a similar one below. This serves the more modest priced grill car on the lower level. Both diners are inter-



Tunnels through mountains could be lined with glass formed by melting the rock surface.

connected and the traveler can take his choice. Placing the eating facilities at the rear will present no undue hardship as trains will be limited in length and scheduled for frequent runs on short headway.

This is MI's visualization of Mr. Burch's tubular railway. It is a composite of several research projects now under intensive development and although it may seem like a pipe dream now, the imminent perfection of structural glass and aircraft atomic power-plant will suddenly catapult it into the realm of solid practicality. As for the Talgo Train, that little gadget has been running for half a decade now, speeding passengers at a safe 100 mph clip.

The tubed train is only one of the startling innovations in the use of glass envisioned by the researchers of Owens-Illinois and other manufacturers. The diminishing supply of metal resources

makes it imperative that new construction materials be found, and glass-makers are convinced that all the properties of metals can be developed in glass.

They see the day fast approaching when the pressure of increasing world population will lead to the erection of entire glass cities in desert and arctic regions—cities constructed on glass columns, enclosed in glass domes, heated and air conditioned by atomic power. Inside the glass cities of the future will be glass homes, glass furniture and glass cars, planes and trains—all combining the structural strength of steel with the transparency and beauty of crystal.

But before these things exist, it's possible you may see MI's A-powered trains in glass tubes, zipping from coast to coast at 300 mph—a fitting beginning to our new series on the Amazing Marvels of Tomorrow! •

AIR-SEA FIGHTERS

BY C. B. COLBY

IT KILLS us to admit it but the British have sneaked in with two more aviation firsts—a jet powered flying boat and a seaplane fighter with retractable hull.

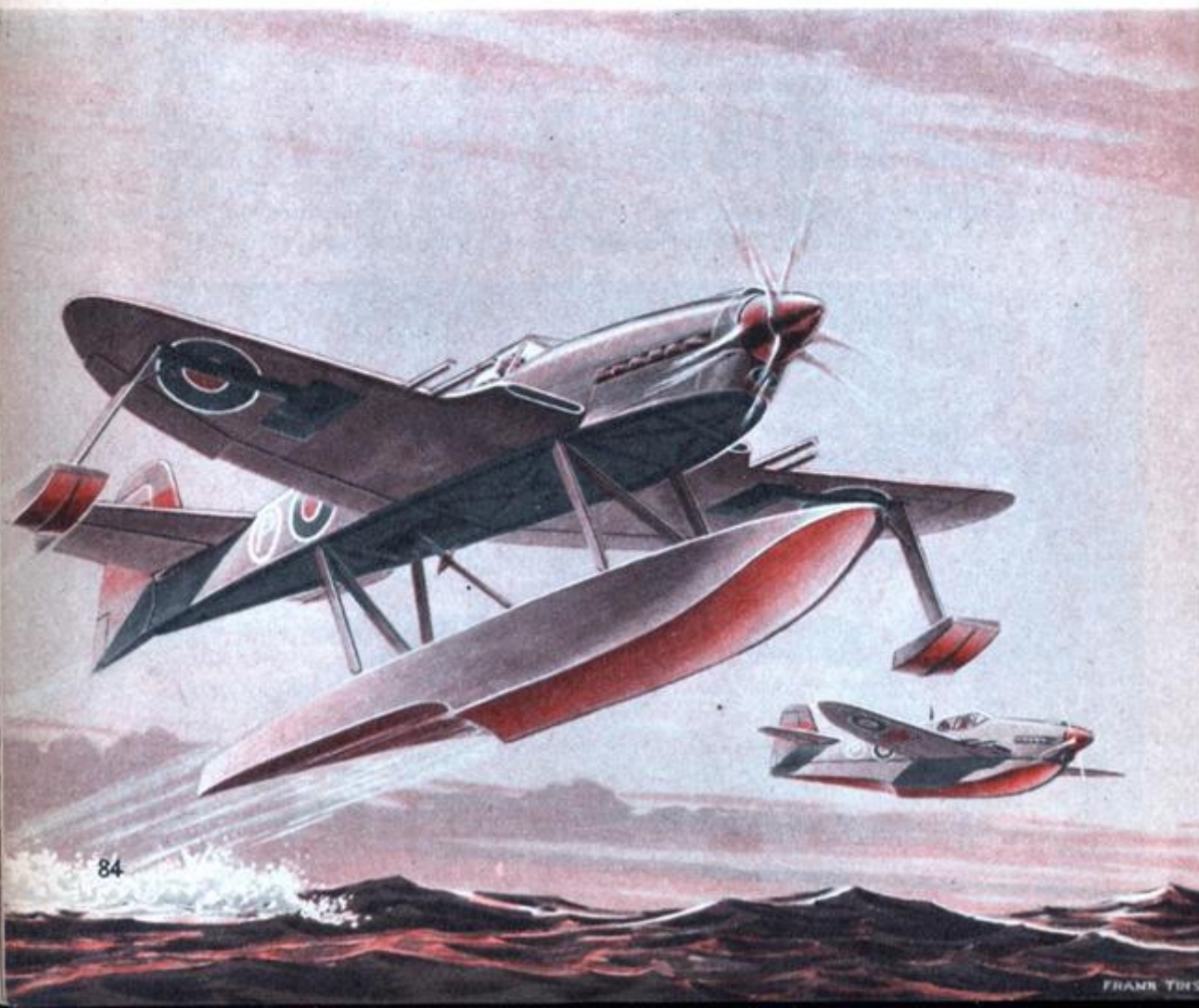
From the Saunders-Roe back room comes the single seater SR/A1 jet fighter, one of the most interesting as well as prophetic aircraft of recent times. (See drawing at right.) This amazing little "pint-size clipper" with a nasty sting is the first boat-hulled aircraft to be powered with jet engines.

Powered with two Metrovick F2/4 axial flow jet engines manufactured by Metropolitan-Vickers Electrical Co., Ltd., the SR/A1 is said to have performance "definitely in the fighter class." This obviously means a speed of well over 500 mph plus unless British "fighter class" speed is based upon war year fighters. That it is expected to be in there "pitching" in case of trouble is indicated by the double brace of 20-mm cannon in the nose. These four "concealed weapons" are serviced

via hinged covers along the sides of the cowlings.

Physically the SR/A1 is a high-wing designed all-metal flying boat with a two-step hull, single rudder and fin and a high-set stabilizer-elevator. The single seat is set just about amidship the leading edges of the wings and is canopied with a sleek blister giving 360-degree visibility. The cockpit is pressurized for high altitude and there is an emergency pilot ejector device for a quick escape in case the other fellow beats the SR/A1 pilot to the draw.

The jet engine exhausts are aft of the trailing edge of the wing and are sleekly streamlined into the hull sides. The two Metrovick jet engines were selected for the powering of this fighter because of the small overall diameter of each power plant. This fact enabled them to be submerged within the hull without increasing the width of the boat other than ordinarily required for good hydrodynamic consideration. The jet exhausts are only





FRANK TINSLEY '47

slightly wider than the actual width of the hull itself at the point where they emerge and thus it is barely nine feet between the "pipes." This gives a very small yaw moment when one engine is stopped in flight—a yaw that may be promptly corrected with the rudder, and that correction so slight that it produces no drag from the tail.

With the engines submerged within the hull the wing may be designed for high speed without having to compromise with engine nacelles or intakes. The high-speed section of the wing has a single spar and an aspect ratio of 5:1 while the taper ratio is 2:1, giving the leading edge a decided sweepback.

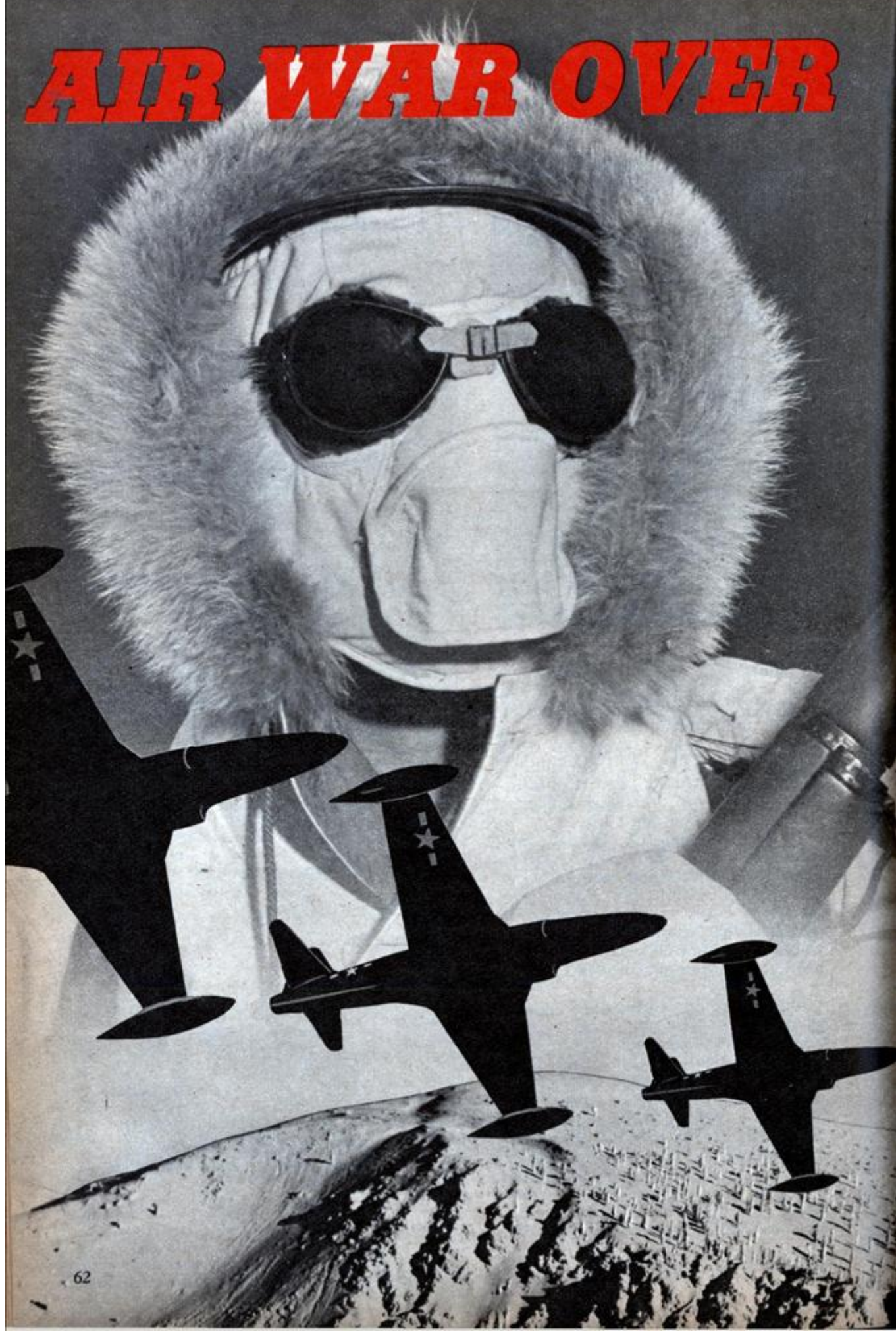
The two-step hull breaks the smooth over-all lines, but the steps, designed by Arthur Gouge (who designed the Saro automatic mooring device also incorporated in the SR/A1) are of a low-drag form. The front step is of a "V" design in plan form and the aft step is a vertical knife edge. The over-all length of the SR/A1 is 50 feet while the span is 46 feet. The height is 17 feet and the hull beam width is just under seven feet. The wing area is approximately 415 square feet.

The other British first is the N.2/42, a highly original answer to the problem of designing a low drag, reciprocating engine, seaplane fighter. (See drawing at left.) This problem has always been a tough one to crack. A pusher propeller abaft the pontoon won't work because during take-off, the seaplane's tail hunkers down into a flurry of spray and wake that would half bury the blades. On the other hand, to get necessary clearance for a tractor-type prop above the float, the fuselage must be hiked high on tall, stilt-like legs. That's all right for taking off and landing, but in combat flight, the added drag of even the most highly streamlined pontoon and pylon arrangement pulls the seaplane's performance far below that of wheeled fighters.

The British solution of the puzzle is to have the ship take off, then retract the main pontoon up against the bottom of a comparatively shallow fuselage. At the same time, the wing-tip floats swing upward into the wing and presto—we have a remarkably clean, sea-going fighter!

The N.2/42 is powered with the latest Napier "Sabre," a four-bank, 24-cylinder engine, developing 3,000 b.h.p. •

AIR WAR OVER



THE ARCTIC

Our planes are waging a relentless battle to conquer polar cold and guard America against sneak attacks across the world's roof.

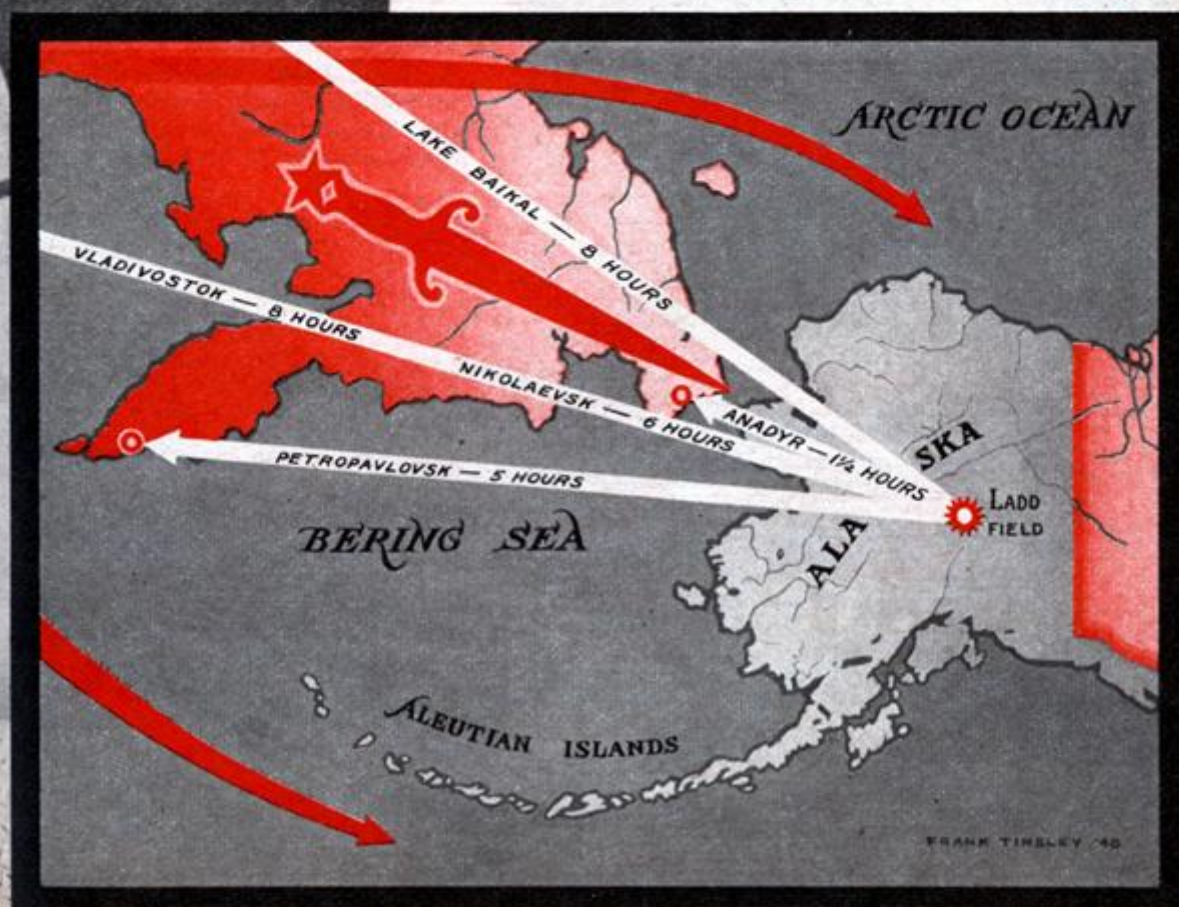
*By Major General K. P. McNaughton,
U. S. Air Force*

FOR nearly four centuries the Arctic defied the hardiest explorers from the temperate zones. This vast ice-locked world with its midnight sun, Aurora Borealis and paralyzing cold has been an impregnable barrier across the shortest route between the East and West.

Now the development of long-range aircraft is wiping out that barrier and, for the first time, exposing America to bombing and invasion by air. The polar regions have become vitally important to our national defense. For, should that dreaded World War III suddenly explode upon us, the key battles probably will be decided in the air over the Arctic.

By traveling the polar routes, military aircraft now

If East-West tension bursts into war, B-36s based at Ladd Field, Alaska, could knock out the Trans Siberian railway and cripple Russia's power in Asia. B-36 flying time to possible Soviet targets is shown in white arrows. Red dagger, arrows mark our danger points.





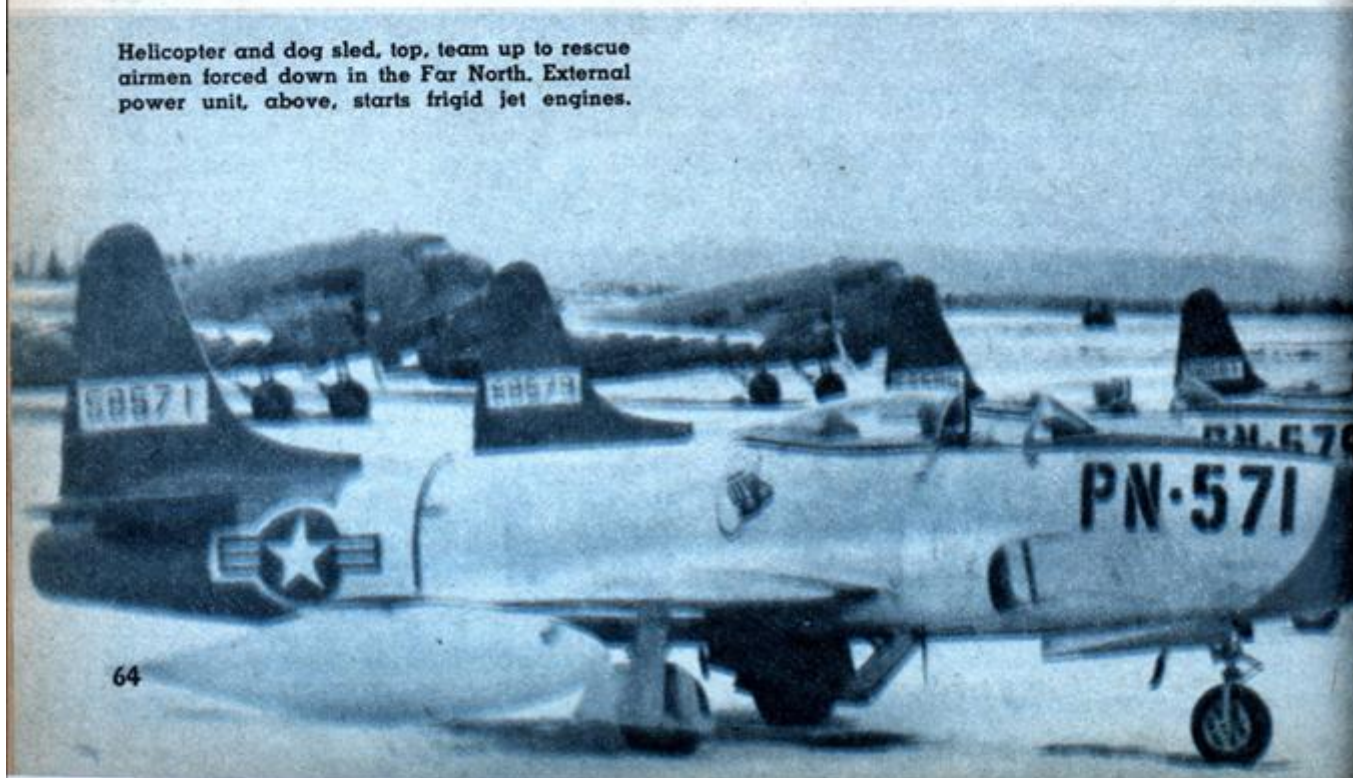
Helicopter and dog sled, top, team up to rescue airmen forced down in the Far North. External power unit, above, starts frigid jet engines.

may fly with ease from the major cities of Europe and Asia to the industrial centers of the United States. For example, by way of the Arctic, the air distance from Chungking, China to New York City—two of the world's most strategic cities from the military viewpoint—is a mere 7800 miles against 12,700 by land and sea. Long-range jets could cover that shorter route in a matter of hours, where the conventional surface journey would take at least three weeks.

Should an airfield be set up on the frozen wastes near the North Pole, cities open to shuttle air attacks would include New York, 2950 miles away; San Francisco, 3150; Detroit, 2850; Moscow, 2050; Berlin, 2200, and London, 2300.

In these tense times, America therefore must keep a watchful "aerial eye" guarding the top of the world. To fill this need, the United States Air Force is training and organizing what might be called an "Arctic Air Force" to meet and destroy any enemy bombers or guided missiles before they can strike our industrial targets.

Three large Air Force fields are now in operation in Alaska. At Ladd Field, near Fairbanks, an outdoor cold-weather test unit is maintained. In the immediate area, at Mile Twenty-Six,



a World War II fighter base has been enlarged to accommodate our heaviest bombers. To the west, near Anchorage, Elmendorf Field is under expansion. Emergency airfields are located throughout Alaska and at strategic points along the Aleutians.

Flights by Alaska-based squadrons during the past two years have shown our Air Force how to operate planes and equipment efficiently in the polar regions and have proved that U.S.A.F. units can fly anywhere in the Arctic during any time of the year. It is no accident, moreover, that jet planes have been undergoing intensive tactical exercises up there for well over a year.

Within recent months remarkable progress has been made in our knowledge of polar aerial navigation. Alaska has been mapped comprehensively for the first time in history. Our airmen have cleared up much of the mystery concerning the magnetic north pole—which is really three poles in a magnetic field in the vicinity of Prince of Wales Island. Now, thanks to such discoveries as this and a revolutionary system of navigation, a pilot can fly anywhere and fix his location to within one mile.

When the 46th Reconnaissance Squadron arrived in Alaska, navigators found their maps were marked with huge white areas marked "Unexplored." They also found that the charts used in the lower latitudes were not practical for polar, or high-latitude, navigation.

Converging latitudes at the top of the world made guesswork out of most attempts to navigate [Continued on page 146]

Snow-equipped paratroopers, top look happy before bailing out of a C-82 Packet in Exercise Snow-drop. After landing, soldiers, right, man a gun.

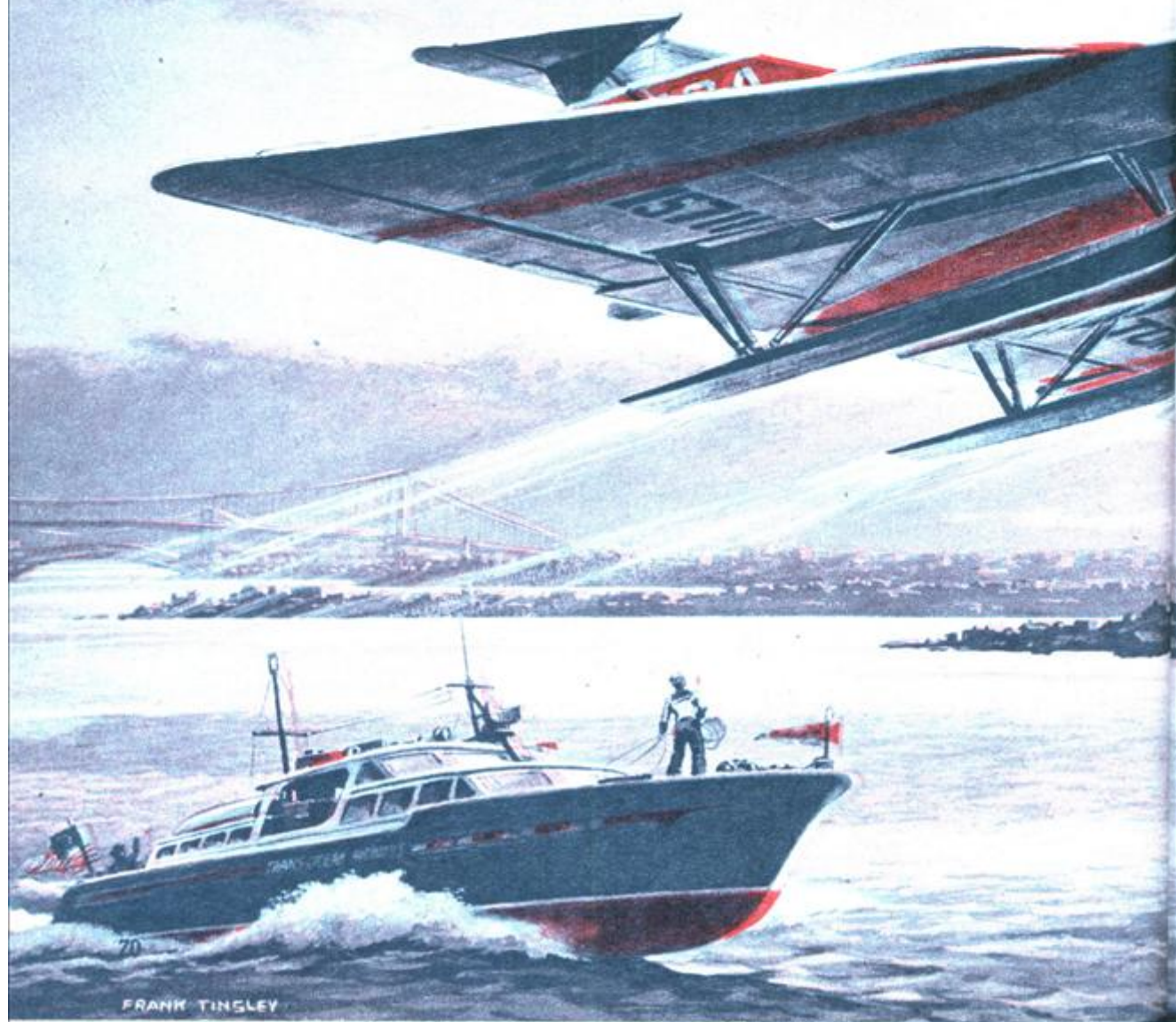


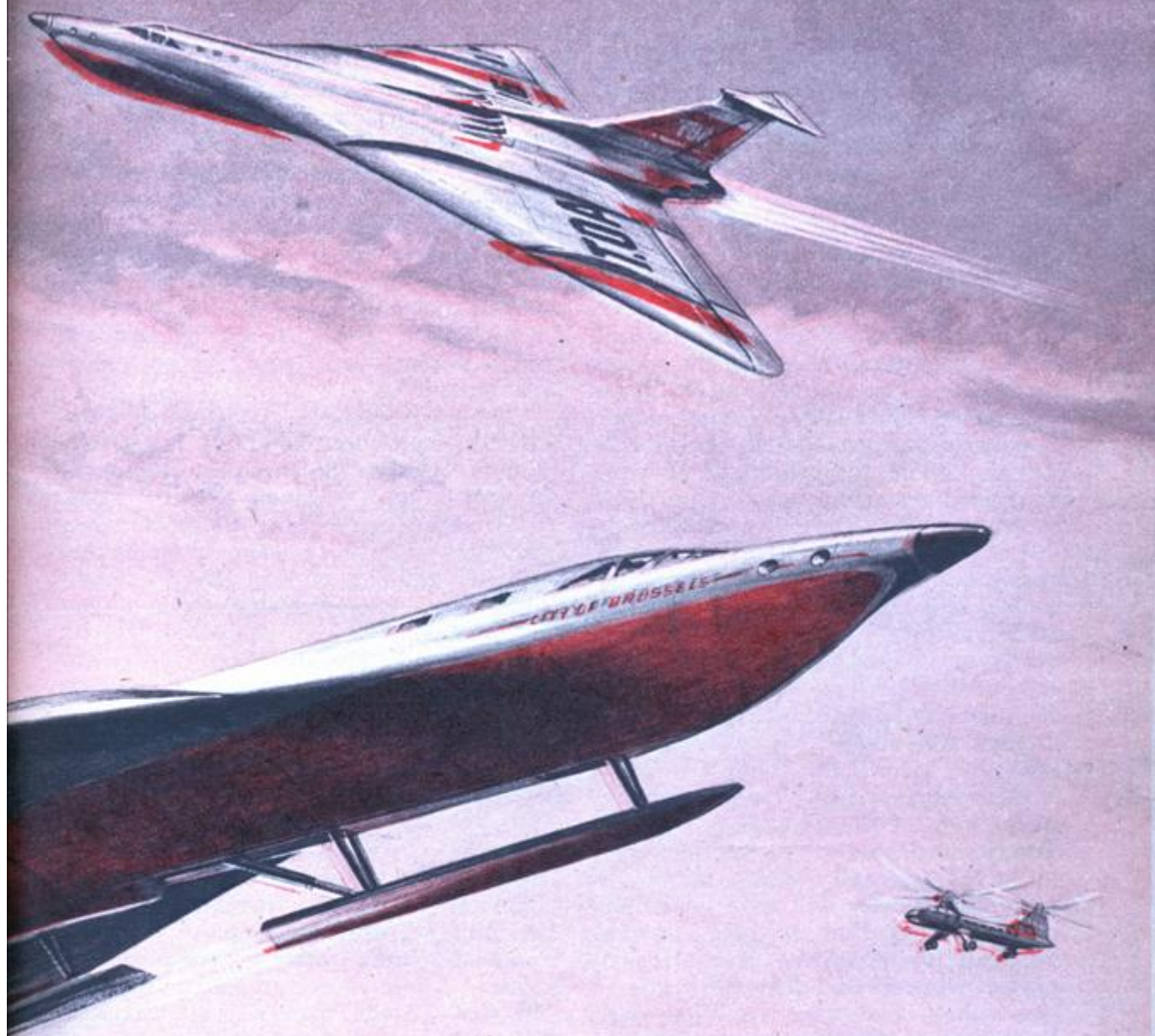
First jet unit ordered to Alaska for combat maneuvers over the Arctic was the 94th ("Hat-in-Ring") Squadron. Here, the full squadron lines up for a subzero flight.

Atomic Planes Are Closer Than You Think

High-payload atom-powered jet flying-boats within the next five to ten years; that's MI's prediction, based on a study of design trends and necessities.

By Frank Tinsley





THE buckaroos of science are breaking the atom to harness at a fantastic rate. In just 15 short years, fission has grown from a super-secret equation whispered in a President's ear to a solidly established 14-billion dollar industry. The hectic stage of A- and H-bomb monopoly is fast giving way to a happier and less explosive phase of atomic development. Late last year

Congress enacted the Atomic Energy Act of 1954; directing that the atom's neglected humanitarian potential be put to work "to promote world peace, promote the general welfare and increase the standard of living." Along with this, President Eisenhower launched his World Atoms-For-Peace Program to spur the exchange of knowledge and the rapid development of international

A-plane landing weight will equal takeoff weight—one reason the low-profile flying-boat is best design for fission-powered planes.

atomic power projects of all kinds.

While this constructive harnessing of the fission process may seem new to an uninformed public, it is pretty much "old hat" to the physicists and engineers on the inside. For several years now, pilot A-power plants have been operating here and abroad. A marine adaptation, employing the "slow fission process," is successfully propelling the submarine Nautilus, and a "fast fission" version is being installed on the newer Sea Wolf. In the latter type, neutrons travel more than 10,000 miles per second to split the nuclear fuel and release its energy. It has the advantage of being small and concentrated, and suffers little neutron loss.

It is easy to see why atomic prospects have kindled the interest of power companies, large industries and equipment manufacturers. When the Pentagon recently asked for bids on an order of standardized package reactors, 100 eager companies responded and the Army is satisfied that some 30 of them have the necessary plant and know-how to be considered seriously. These outfits are well aware of the difficulties involved. The atomic field is still very much fouled up in red tape and military secrecy, so company security will be a formidable item. The handling of "hot" materials will call for expensive precautions to protect workers and dispose of radioactive wastes. Insurance is another major headache—underwriters are still dubiously studying the problems of employee health and accident coverage. Despite all this, the companies realize that we are now in the atom age up to our hips and like it or not, their future is tied up in the atomic business.

The success of the submarine Nautilus and the navy's plans for atomic airplane carriers, etc., has sparked the imagination of the transportation industry. Steamship operators are toying with the idea of fission-propelled passenger liners and freighters. Atomic locomotives are on the drawing boards and even such

unlikely notions as A-engines for trucks and cars have been seriously discussed. In most of these cases, the weight problem is not too critical. In the field of aviation, however, shield tonnage has been a grade-A headache. Early types of reactors were enclosed in a shell of solid lead or concrete to protect their operators from deadly radiation. This meant that only an elephantine aircraft could carry it aloft and even then its flight performance would be decidedly hampered.

Then the endless, painstaking work of the researchers suddenly burst into bloom. Within the past year, engineer-scientists have evolved shield designs which whittle down the weight to manageable proportions. The new, lighter shields differ from yesterday's monolithic types by being a composite of various materials, each selected for its efficiency in screening an individual fraction of atomic radiation. These "plies" include comparatively thin, four-inch layers of lead, hydrogen-containing materials, etc., etc. Their exact composition and design is, of course, one of our most precious military secrets, but the shield's successful development is said to more than meet the target specification at which the researchers were shooting—a shielded reactor weighing no more than today's transport fuel loads. These represent about one-third of the average plane's gross take-off-weight for craft with reciprocating engines and around 45 per cent for jet jobs.

This generally accepted fact inclines A-plane designers to favor the flying-boat type rather than a landplane model. There are several good reasons for this. First of all, we have the little matter of landing wheels, now already nudging the economic weight limit. The boat hull, while structurally heavier than the landplane fuselage, is still a lot lighter than the fuselage-plus-wheels. Also, the landplane normally ends its trip with its fuel tanks nearly empty. Its gear is therefore designed to take around a

1. Bridge; 2. Crew; 3. Library; 4. Lounge; 5. Bar-grill; 6. Galley;
7. Stores; 8. Lavatories; 9. Passage; 10. Main cabins; 11. Emergency exits; 12. Multi-cell wing; 13. Stabilizer; 14. Atomic pile/control station; 15. Six atomic jet engines; 16. Auxiliary liquid rocket engine.

DETAILS OF MI'S

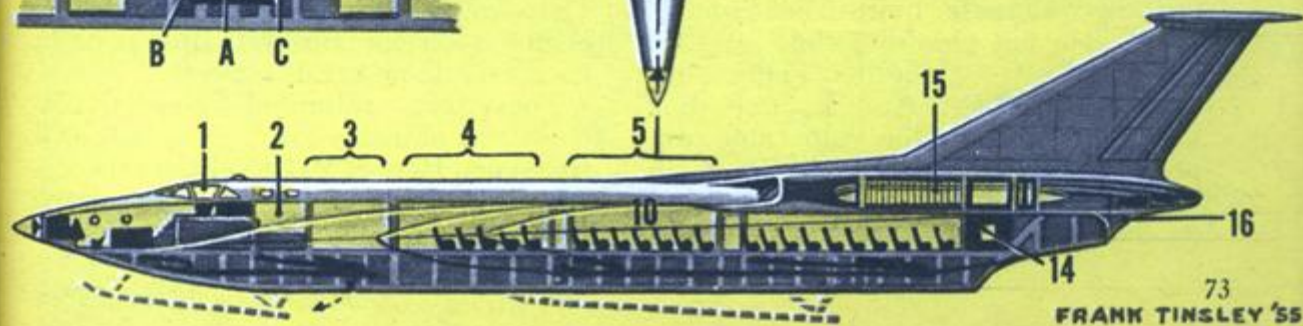
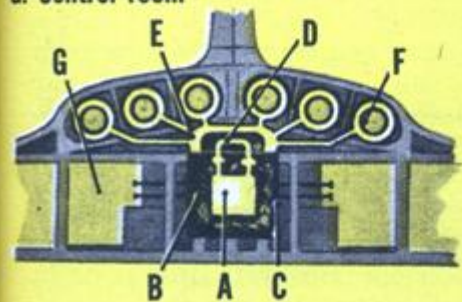
A-PLANE DESIGN

Retractable aqua-skiis lift hull above the waves for rough water take-offs

Wide V-bottom hull and "skate" configuration is practically uncapsizable

SCHEMATIC LAYOUT OF ATOMIC POWER PLANT

- A. Atomic fission pile
- B. Atomic ray shielding
- C. Heat insulating space
- D. Shielding heat exchanger
- E. Heating medium flow to engines
- F. Jet engines
- G. Control room



third less landing jolt—a considerable saving in tonnage. The A-transport, on the other hand, will expend only half a pound or so of nuclear material on even the longest flights and will land just as heavy as it took off. Consequently, its wheels would have to be at least one-third heavier than those of a fuel-burning sister of similar size and weight. It is obvious that the extra burden makes wheel gear impractical.

There is also the problem of the extreme runway length required. We simply cannot afford to go on extending our runway and airport areas indefinitely. It has been estimated that the facilities offered by a hundred-million dollar land airport could be duplicated in a water base costing not more than a fifth as much—with no bad weather “stack-up” of waiting planes or runway traffic tieups. In addition to being cheaper and far safer, water bases are more convenient. Most major cities, both here and abroad, have ocean, river or lake frontages, complete with existing pier and harbor facilities. Instead of dumping passengers at distant airports and then forcing them to waste time and money on long bus or taxi trips to town, the flying-boat is warped into a city dock and passengers debarked practically in the center of town.

Early flying-boats were just what the name implies—boat hulls with wings tacked on. Until recently, their unwieldy form resulted from a series of design compromises dictated by their propeller power plants. As it was essential to keep the fragile, fast-whirling tips clear of the water, engines and wings had to be set high. To hold them aloft, high, narrow hulls were necessary. This tippy arrangement made some sort of lateral support necessary for surface taxiing, so a pair of long, spraddle-legged, wingtip floats were added. This also added to the ship's air resistance and the sum of all these “built-in headwinds” was a safe but painfully slow aircraft.

The advent of the jet engine has changed all this. A wake flattening back-blast replaces the vulnerable propeller and the engines can be set much closer to the waterline. This in turn, enables designers to lower the whole air-

plane profile, resulting in a stronger structural unit, better streamlining and vastly improved seaworthiness. In a bold break from past flying-boat practice, Convair engineers exploited these advantages in a radical, new concept based upon one of nature's most efficient marine forms—the deep sea Skate.

The result was the Sea Dart (XF2Y-1), a flying-boat fighter whose broad delta wings blend into a flat, vee-bottomed body in a symphony of beautiful lines. Propelled by two Westinghouse jets, it proved as fast as any land-based fighter aloft. The Dart takes off and lands on retractable aqua skis which further improve its already outstanding waterability. Reportedly, the tiny fighter can set down in seas that would swamp the biggest of the old style boats and can take off in a fraction of the run formerly required.

The Sea Dart is much more than just another fighter design. Actually, Convair engineers regard it as an operating scale model of tomorrow's big, seagoing, air transports. They are betting that such boats will be desperately needed in the event of another major war. Informed military opinion now inclines toward the belief that massive Soviet submarine strength will render the oceans' surface untenable. They argue that our ship and cargo losses would constitute such a drain as to bankrupt the country in a matter of months.

The only practical answer, they say, lies in huge, flying-boat freighters, capable of dispersed landing on any reasonably protected water area and of discharging troops and cargo directly on the beach. Such a fleet would provide a high degree of safety, great operational flexibility and by stretching out our overseas bases to miles of thinly concentrated supply dumps, would stymie defensive A-bomb attacks. Air cover would be provided by Sea Dart type fighters. These could escort the freighter fleets on even the longest hops, refueling in flight from atomic-powered tankers.

These big, unlimited range flying-boats are naturals for high speed, civil transport. Hence, MI has chosen the flying-boat for its atomic passenger plane design. The wide hull and deep, blended-

in wingroots, offer unparalleled interior space for comfortable seating, luxury lounges and room to move about. In the luxury design shown, 192 passengers are accommodated in wide reclining seats, facing rearward for maximum safety in rough water landings. When they weary of just settin', there are broad aisles to promenade, a salon in which to lounge and chat, a bar and grill catering to the inner man and a library/writing room for that last minute letter or executive conference. Liberal space is provided for lavatories, galley, stores and rest rooms for the off-duty crew. At the rear of the passenger cabins, emergency exits unfold to form boat launching platforms. The exit corridors are flanked by stowage space for life preservers, outsize rubber rafts, etc.

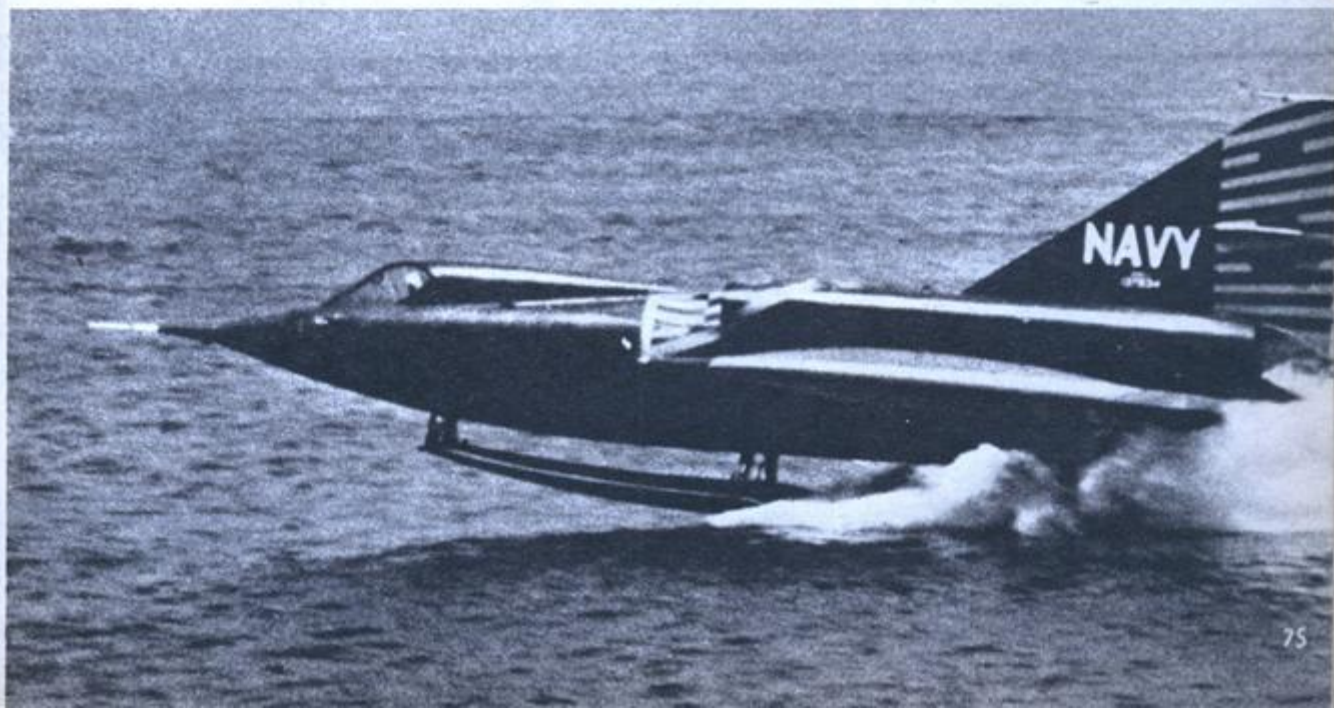
The atomic power plant is situated on the ship's center line, back in the extreme tail section. It follows the latest trend in aircraft A-design in which nuclear heat simply replaces the conventional fuel burners in jet engine combustion chambers. To keep the center of gravity low, the reactor is placed just above the keel, as far as possible from the plane's passenger areas. In operation, molten metal is circulated through the super-hot atomic pile and then pumped into a heat exchanger mounted atop the reactor. The two form

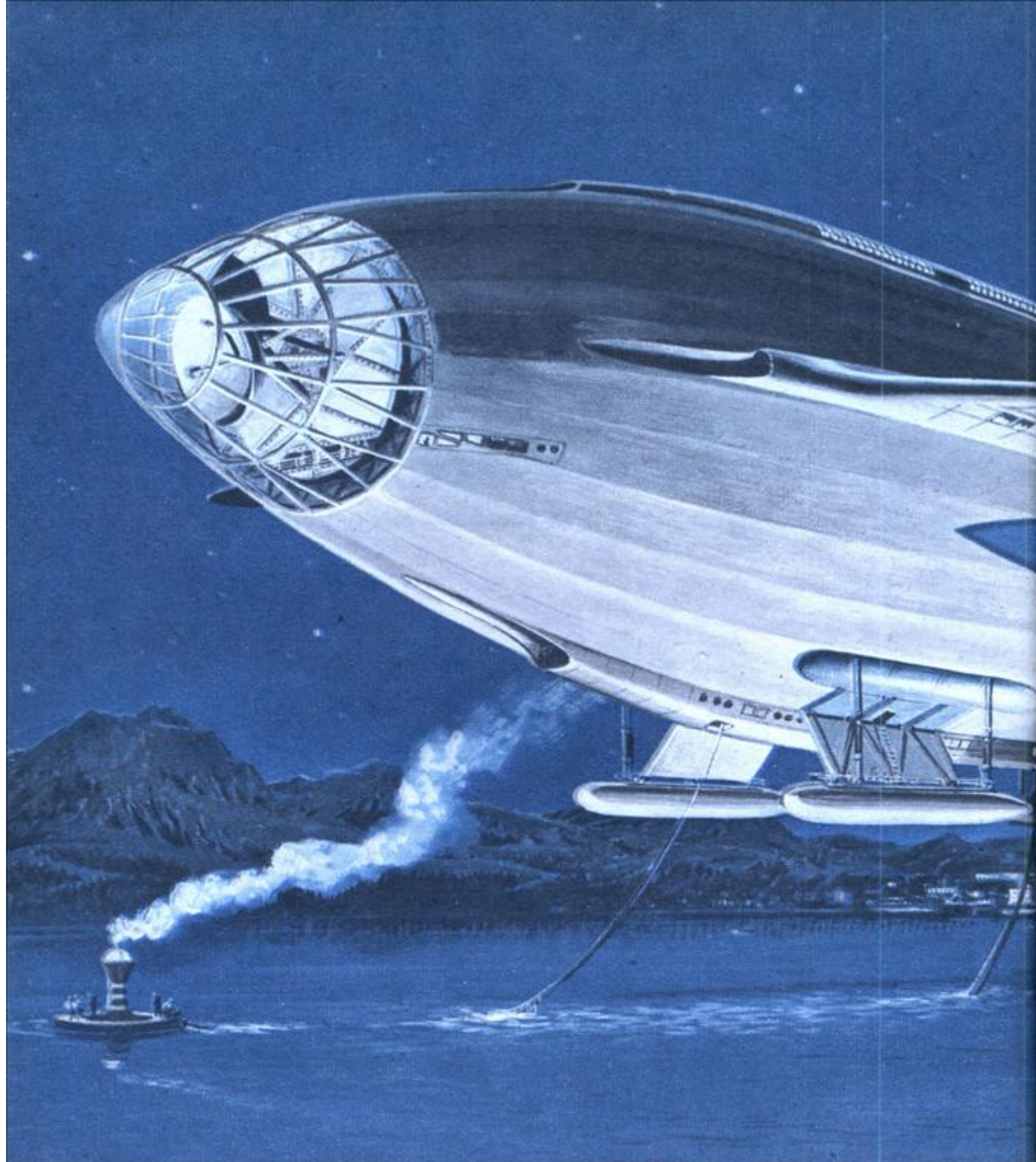
a unit, enveloped by a single, composite type shield to enclose dangerous radiation. Surrounding the exchanger shielding is a manifold in which non-radioactive water picks up the heat, transmitting it to the engine combustion chambers through insulated, high-pressure pipes.

The jets—six of them—function in the usual way, drawing in air, compressing it and forcing it into the combustion chamber. Here it is expanded by nuclear heat, turns the engine-operating turbines and is expelled through the tail-pipes in a propulsive blast. The water—or other heat transmitting medium—is then returned to the exchanger in a continuous, closed-circulation system. In addition to the jets, a liquid fuel rocket engine may be mounted in the tail for emergency or booster power.

These giant boats, capable of almost unlimited flight and able to take off or land in the open sea under the severest weather conditions, offer transoceanic travelers a degree of speed, comfort and security now unattainable. Equally efficient over land routes—their rugged keel structures are better able to sustain "belly landing" than any landplane fuselage—they promise eventually to take over all long distance runs. You'll be riding in them within ten years. Atomic planes are closer than you think! •

The jet-powered Sea Dart is regarded as an operating model of huge transports to come.





Here's how MI's atomic dirigible would look hovering. The huge radar-domed craft has

*Here is a bold plan for displaying peacetime
uses of the atom to the peoples of the world.*

By Frank Tinsley

Why Don't We Build An Atoms-For-Peace Dirigible



retractable pontoons which would enable it to land in harbors of countries it visited.

EARLY last year, President Eisenhower asked the Congress for funds with which to build a fission-powered merchant ship for the global spread of peaceful atomic knowledge.

"Visiting the ports of the world," the

President stated, "the ship will demonstrate to people everywhere the peacetime use of atomic energy, harnessed for the improvement of human living."

In Washington, the basic idea of a floating exhibit of American fission tech-

niques was received with general approval by members of the Congress. Some of the plan's technical aspects, however, generated a bit of discussion. To avoid protracted experimental research and thus speed the ship launching date, it was originally decided to fit the vessel with a duplicate of the power plant used in the atomic submarine Nautilus. This notion was greeted with some misgivings. Atomic Energy Committee experts felt that we had already progressed well beyond the Nautilus installation and that a more advanced model was in order. The question before Congress, therefore, has been whether to blow 40 to 50 million dollars on an already obsolete "quickie" or to go slower and get a more advanced sample of our atomic progress sometime around 1959.

Like Congress, MI feels that this is no decision to make lightly. In fact, your editors have dug deep into the basic factors involved, asking themselves whether a ship, with its limited seaborne reach, is actually the most efficient carrier for Ike's traveling atomic exhibit. The only alternative seemed to be some form of aircraft. After eliminating even the largest possible airplanes now in sight as incapable of carrying the necessary load, MI hit upon the idea of employing a huge dirigible as our angel of peace. Here are some of the reasons behind such a concept:

Unlike a ship, the dirigible moves in an aerial ocean that completely envelops our globe. Hence, it can display its wares anywhere on the face of the earth. Seas, mountains and deserts present no barrier. Neither, considering its mission of peaceful education, should national frontiers.

A modern dirigible would be unique, the cynosure of all eyes. Unlike the ship, one-third of whose bulk is hidden by the water in which it rides, the dirigible discloses every inch of its dramatic size as it coasts along against the clear backdrop of the sky. The lower it flies, the more majestic it appears, as anyone who saw the Akron, Macon or Hindenburg will testify. No man-made vehicle has ever presented such an awe-inspiring spectacle as a giant airship breaking

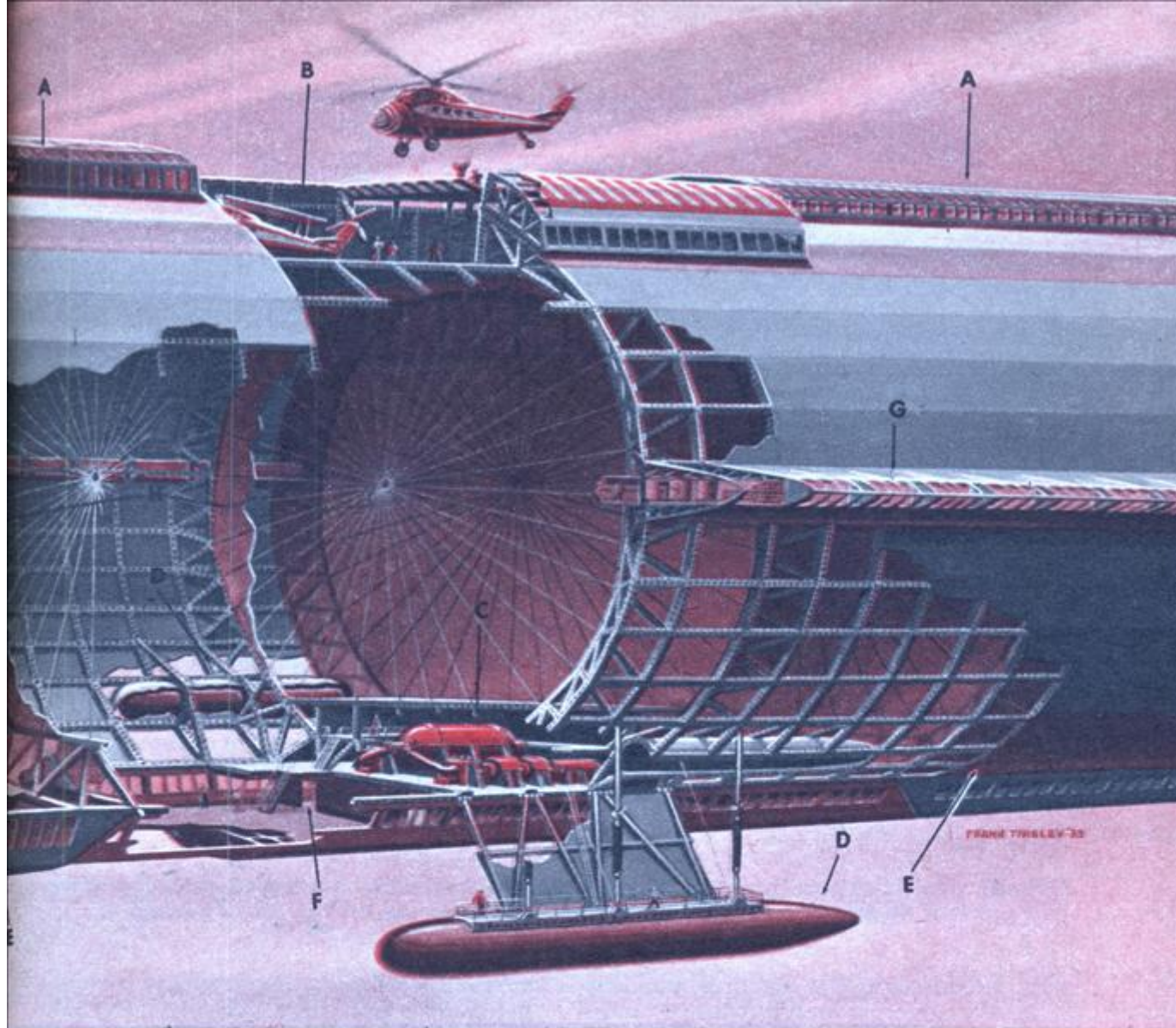
through a low-hanging cloud or cruising above the rooftops of a darkened city.

Its effect upon the peoples of the world would be many times more potent than that of an ordinary-looking, seaborne freighter. The fact that the dirigible, traveling at relatively low speeds and altitudes, a silvery giant by day and dramatically illuminated at night, will be visible to practically everyone en route, makes it the perfect Atoms-For-Peace transport. It can show our flag in every nook and corner of the globe, scattering as it goes messages of good will in every literate dialect.

MI's proposal for an Atoms-For-Peace airship, calls for a continuation of airship development as pioneered by Zeppelin, Eckener and Arnstein, with the addition, wherever practicable, of modern materials and methods. Magnesium, titanium and strong, lightweight Fiberglas promise greater ruggedness and durability with less poundage. This improved weight-strength ratio opens new possibilities to the dirigible engineer. For instance, the single, bottom-keel structure, an outgrowth of age-old surface ship design, might be augmented by external side and top "keels," containing additional passenger accommodations. These extra stiffeners would vastly strengthen the airship longitudinally without too great a weight penalty.

In place of the Akron and Macon pickup gear and airplane hangar, a modern helicopter landing pad and internal hangar deck might be installed atop the hull's center section. Built in the form of a shock-absorbing elevator, the pad could lift the copter clear of the hull for take-off and after landing, lower it to the level of the protected hangar deck for the safe, comfortable unloading of passengers. This is merely a reversal of the earlier airplane setup with the added safety advantage that both copter and airship travel at the same speed. The copter could provide a ferry service en route and at points where it is inadvisable or impractical to land the airship.

Another possibility is the development of water landing gear. A seagoing dirigible, embodying a water-tight hull and lower gas bag, was recently publicized in Germany. MI feels, however,



Cut-away of center section shows structural detail, power plant, retractable landing gear and heliport. A. Promenade decks. B. Helicopter landing pad and hanger. C. Atomic power plant. D. Retractable pontoons. E. Public rooms. F. Detachable exhibition hall. G. Passenger gangway cabins and private sun parlors. H. Bulkheads between gas cells.

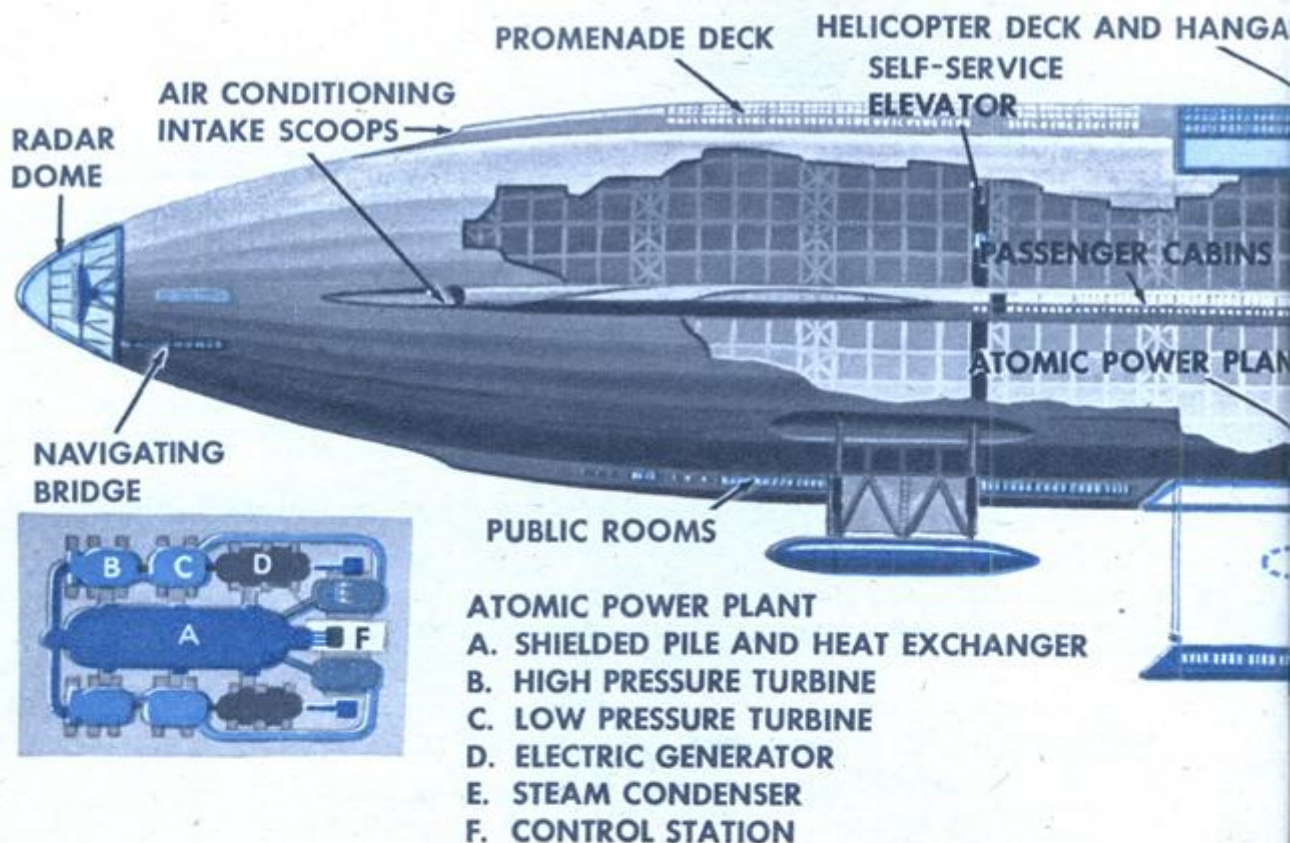
that retractable pontoons of inflated rubber would prove lighter and more efficient. They need not be large, as airships can be trimmed so as to be almost weightless. Water, pumped up from the surface—using the hose gear long since perfected—would provide ballast to hold the ship down when anchored.

Due to the horsepower limitations of the early internal-combustion engines, dirigible designers have always had to install multiple power plants, scattered along the length of the ship. This has not proven too good an arrangement. In addition to difficulties in coordination,

the propeller slip-streams have added to the skin friction of the hull with a consequent increase in drag. Modern research indicates that some form of dragless stern propulsion would better the airship's efficiency and speed by as much as 15 per cent.

With this in mind, MI weighed the various power plant possibilities.

The final solution proved to be the easiest to apply and the one that offers the maximum advantages weightwise. This is a midship atomic steam plant using turbines to generate electricity. Comparatively lightweight wiring car-



Overall view of Atoms-For-Peace Dirigible shows its unique A-powered propeller drive and unusual exhibition hall which could be lowered to the ground and detached to . . .

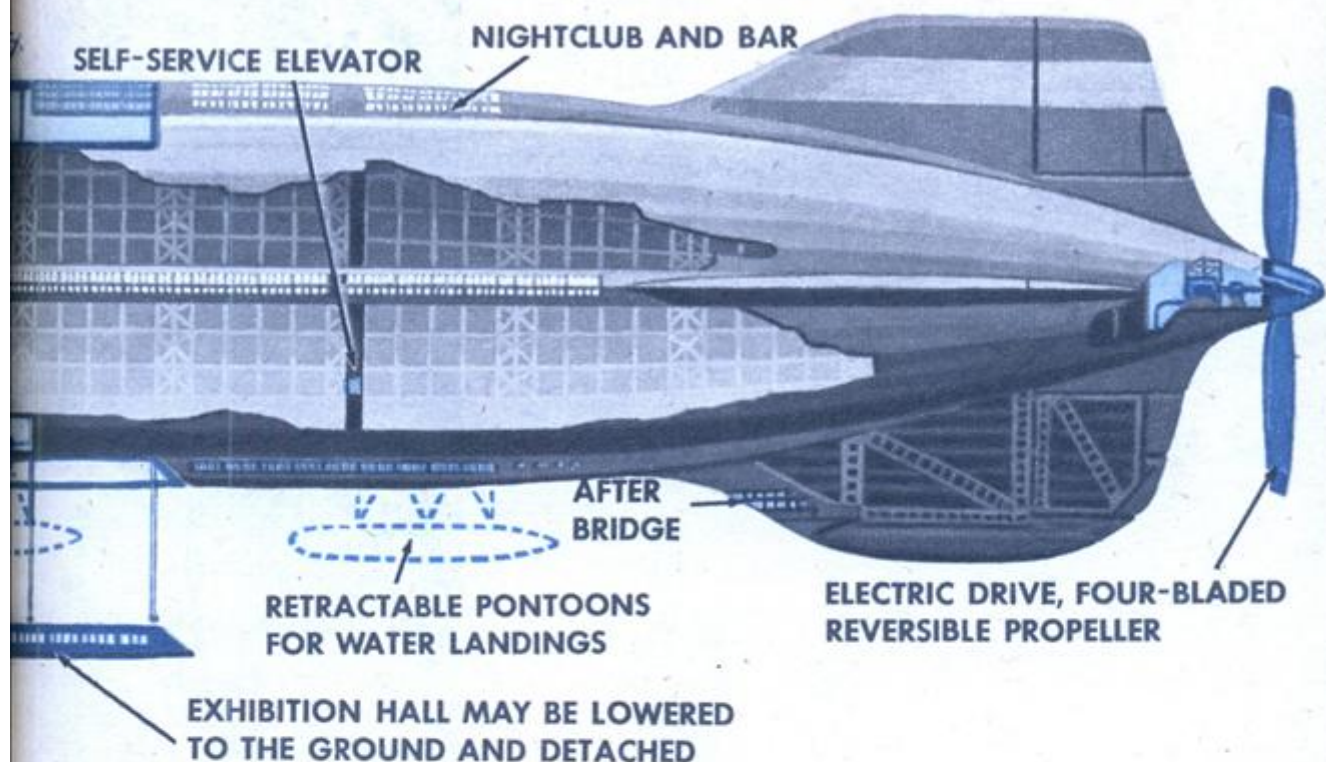
ries the juice to the stern of the ship where an electric motor drives a huge, four-bladed, reversible propeller. To assist in landing and take-off maneuvers, ducted fans are mounted in gimbals in the forward and after stabilizers. These enable the skipper to move his ship up, down or at sidewise angles.

The fission plant is of the latest type, consisting of a central reactor contained within the core of a cylindrical heat-exchanger, the whole being enclosed in lightweight, laminated shielding. Its operation is simple. Steam, generated in the exchanger by the heat of fission, is ducted to twin turbine-generator installations set on either side of the reactor. Passing successively through high and low pressure turbines, the used steam is condensed and routed back to the heat exchanger in a closed system. The turbines drive twin generators and the electricity thus produced, passes into storage batteries. While heavier than a

single installation, the duplicate turbine generators provide a safety factor, one being always available in the event of mechanical failure or repair work on the other.

This compact arrangement is mounted on a reinforced deck within the hull and may be readily reached from the exhibition hall directly below it. Galleries around the engine room permit visitors to inspect the unique plant without interference or danger to themselves. If the public exhibition is considered sufficiently important, a water shielded "fishbowl" type of reactor might be used. While heavier and less compact, it would provide a more impressive show.

The passenger accommodations of MI's Atoms-For-Peace airship also differ from those of earlier dirigibles. As in the Hindenburg, the public rooms and promenade decks are sited in the lower hull and bottom keel. In addition, however, there is a brand new feature—



... display the peaceful uses of atomic energy. All levels of the giant ship are interconnected by longitudinal and transverse gangways, stairs and self-service elevators.

the exhibition hall, previously mentioned, that is incorporated in the center section of the keel. Fitted with an entrance and exit at either end, and filled with samples of peaceful atomic age technology, this section can be detached and lowered to the ground at various stops. Staffed with trained guides and attendants, it can be left at main population centers while the airship cruises over the country's smaller towns and villages, showing the flag of good will.

Just over 1,000 feet long, with 10 to 12 million feet of helium capacity and a 100-ton payload, MI's atomic airship is half again as big as the Hindenburg and corresponds in size to a modern dirigible now on the Goodyear Aircraft Corp. drawing boards. In a letter to your editor commenting on this Atoms-For-Peace dirigible project, Dr. Karl Arnstein, former design chief for Count Von Zeppelin and his successor Dr. Hugo Eckener, and at present vice-

president of the aircraft division of Goodyear, wrote: "Goodyear Aircraft engineers consider it an intriguing new approach to the Atoms-For-Peace program and think that the principle of taking the atom abroad via the airship is possible of technical accomplishment."

That experienced German dirigible experts think it is practical is evidenced by a recent proposal by Max Pruss, former captain of the Hindenburg. He urges the West German Government to build an atomic airship forthwith. "The dirigible will be the first to use the atomic engine," he says, "because it is the only aircraft capable of carrying the weight."

Here, then, is MI's contribution toward the Atoms-For-Peace crusade. We believe such an airship to be entirely practical, safe and the best possible vehicle for the purpose. We earnestly petition President Eisenhower and the Congress to consider its merits. •



**Tiny but deadly insect-like tri-tracks
would spearhead our advancing infantry.**

By Frank Tinsley

WE are living in a machine age and our wars have become mechanical, but it's still the muddy, tired infantryman who must storm the enemy's stronghold in bloody assault.

In some cases the tactical situation and nature of the terrain make this necessary. In many others, however, the brunt of the attack could just as

Why Don't We Have...

BABY ASSAULT TANKS



well be absorbed by light, heavily armed machines. Why, then, can't we send in a first wave of baby assault tanks and use our irreplaceable GI's for the less hazardous chore of mopping up?

The primary consideration for such a tank is mobility. Our baby battle-buggy must be able to scuttle rapidly over rough ground, scale steep banks and bridge shell-holes and trenches.

In the design shown here the armored hull is supported by three independently sprung track gears which are joined to the body by long, self leveling legs. In order to span wide gullies the front leg telescopes and is capable of feeling around for a foothold like an insect's antenna. It can be raised, or lowered and swung in a 180° arc. It also can be extended and steered. While all these movements are taking place, a jack is necessary to give temporary support to the apex of the triangle. This can be of the hydraulic type, retractable and operated from within the hull.

Some sort of rear buttress is needed to prevent our buggy from tumbling over backwards while scaling extra steep slopes and banks. Again we borrow from the insect world. A universally mounted tail

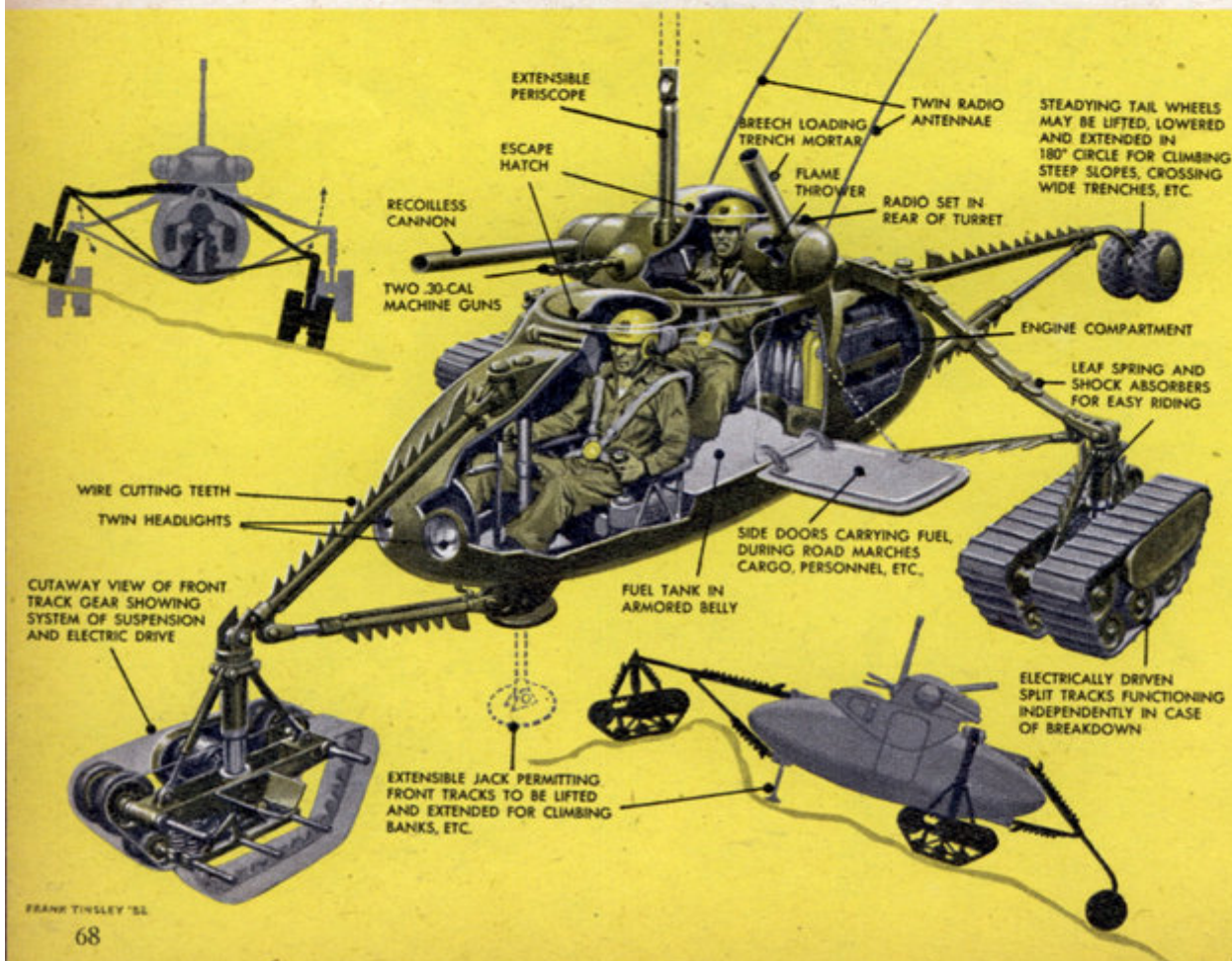
"feeler," similar to the front rig, does the trick. Extended and lowered on uphill grades, it props up our buggy like the tucked-down tail of an insect on a twig.

The hull is cigar-shaped, 12 feet long, swelling to a 3½-foot maximum diameter. It is capped by a revolving turret in which the armament is mounted. This raises its overall height to 7 feet, a minimum for clear vision in high grass or bushy terrain. The width of the main tracks is 12 feet and the machine's overall length can be extended from 24 to 32 feet.

The two-man crew consists of a driver and gunner. The former sits in a bucket seat in the nose and drives by means of two miniature control sticks—one for the main tractors, the other for the nose unit. Other controls, like those found in the cab of an electric power shovel, permit him to manipulate the telescopic nose and tail gear.

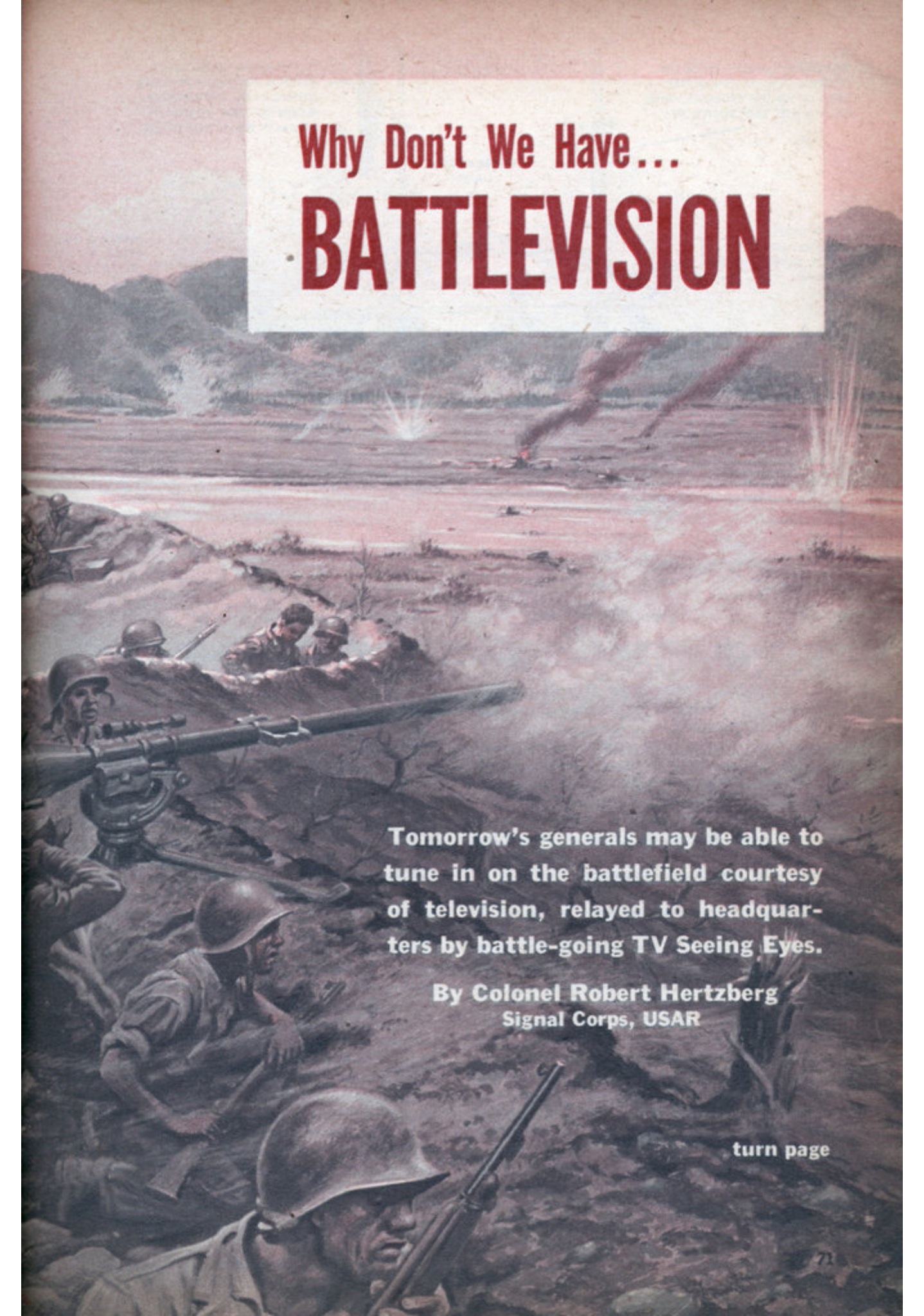
The gunner sits behind and above the driver in a hanging seat that revolves with the turret. The latter is mounted on a circular track with a full 360° traverse and is fitted with ear-like extensions on either side. These are really smaller turrets which revolve in a vertical plane to elevate or depress the guns mounted in them. •

Detailed Cutaway Drawing of Tank



While the battle rages, the Army's Seeing Eye battlevision tank records the action and transmits it back to headquarters where top brass can watch the progress of the fighting and calmly issue the commands.





Why Don't We Have...

BATTLEVISION

Tomorrow's generals may be able to tune in on the battlefield courtesy of television, relayed to headquarters by battle-going TV Seeing Eyes.

By Colonel Robert Hertzberg
Signal Corps, USAR

turn page

TELEVISION CAMERA PERISCOPE
EXTENDS UPWARD FOR BETTER
FIELD OF VISION, RETRACTS WHEN
NOT IN USE. 360° ROTATION

TELEVISION SENDING DISCS
EXTENDS UPWARD FOR CLEAR
SIGNAL PATH. UNIVERSALLY
MOUNTED. 360° ROTATION
RETRACTS WHEN NOT IN USE

OBSERVATION
HATCH

PERISCOPE
DEPRESSED
FOR ROAD
TRAVEL

SENDING DISCS
DEPRESSED FOR
ROAD TRAVEL

DRIVE
SPROCKET

BOGIE
WHEELS

TANK
ENGINE

TANK
TRACK

TANK
DRIVER

TELEVISION
CAMERA

TELEVISION
OPERATOR

ELECTRIC
GENERATOR

TELEVISION
SENDING SET

FRANK TINGLEY '51

THIS is no fantastic rambling of science-fiction!

If there is another war, it will provide definite opportunities for the use of modern television miracles.

TV set owners now enjoy better views of athletic contests than do most people right on the scene. Powerful telephoto lenses reach across playing fields and give spectacular close-ups of a runner dashing for the goal line or of a fielder snatching a high fly. Wide-angle lenses broaden the view and produce panoramic effects of great sweep.

"Why," military people ask, "can't we do exactly the same thing on battlefields that the commercial TV stations are doing on football fields? Our game is rougher and is played for keeps but that's just why the head coach—the commander of an army in combat—should be able to follow the moves of the members of his team. If he can see *what's* going on *while* it's going on, he won't have to wait for reports from his subordinate commanders. Why can't mobile TV vehicles be assigned to combat units just as conventional communication trucks are, so that the commander can instantly see the fighting in any particular area?"

In other words, why don't we have battle-
television?

If this proposal had been made a few years ago it would have been dismissed as wacky. Today, however, battle-
television already exists in technical form and needs only some good engineering to make it practical in tactical form. Only recently, RCA delivered to the Signal Corps an elaborate four-vehicle television caravan designed primarily to explore the possibilities of TV for army field instruction.

Each truck is a ten-ton, six-wheel job. Two are used for transmitting, two for receiving. One truck of each pair carries only electric generators, which are very large because they must supply power for studio-type floodlights as well as for the TV equipment itself. Since the latter alone uses comparatively little power and the battle cameras would operate only in daylight, the overall weight of tactical TV vehicles can readily be reduced by tons. Through tight miniaturization of components, it shouldn't be very difficult to produce a complete TV transmitter that takes only a little more juice than presently is required for a standard tank radio installation. The separate power generator van could then be discarded and the TV unit operated off the storage battery-charging generator combination of the vehicle's own engine.

When you remember that 20 and 30-ton



Transmitting units of the U. S. Army Signal Corps Mobile Television Unit are being used at present to send pictures from remote field activities to military classrooms. Could this actually be training for the real thing?

tanks are hardly more than medium in terms of combat weight, the idea of putting a complete battlevision station into a track-laying vehicle begins to make sense. It can resemble a conventional tank. But because it will hang on the edge of a battle rather than participate, it needs only thin armor and a couple of machineguns for protection against low-flying aircraft. It will do its shooting with a periscope-type camera which can be raised possibly to 30 or 40 feet to scan large areas in all directions.

The parabolic antennas which send out the TV signals are about four feet in diameter, made entirely of metal and easily arranged on folding, telescoping mounts on the back of the tank. At least two antennas would be provided so that any battlevision vehicle could act as a relay station between another TV tank further forward and the receiving stations in the rear. One "dishpan" would pick up the signal; the other would send it along after amplification by the equipment inside the tank. This is precisely the same micro-wave relay method in everyday use for the transmission of TV programs from city to city for chain telecasting.

There is practically no limit to what can be done at the receiving point in the

commanding general's headquarters, since weight and bulk are less important here than up front. Even as it now stands, the receiving half of the Signal Corps' experimental TV caravan is more than adequate to serve an Army HQ. It contains ten 16-inch receivers and a 3x4-foot projection unit. Staff officers watching the small receivers could monitor individual battlevision scenes. Through a simple switching panel, the general could throw any of the latter onto his own big screen. This arrangement merely duplicates the setup in the control room of any large television station.

And the TV camera itself is not limited to the ground. Airborne TV was used experimentally in pilotless planes during World War II and Westinghouse has experimented with Stratovision from a B-29 circling over Baltimore. Also, about three years ago, a New York station put on a terrific TV show from an airplane carrier off the Atlantic coast.

How far can this idea go? Well, in any future war, it is certainly not unreasonable to expect direct telecasts to be relayed via land, surface ship or airplane stations to the domestic TV chains for nation-wide transmission. •

An illustration of a woman with red hair styled in a bun, wearing a red and white striped shirt. She is holding a large, realistic red apple with both hands. The background features a large tree with dark leaves at the top, and a red barn and other farm buildings in the distance under a light sky.

Apples As Big

Scientists are working frantically to produce monster plants in order to feed the world. You can try their wonder drug in your own garden.



As Your Head!

By Donald G. Cooley

HOW'D you like to step out into your backyard and pick a two-pound apple? Or a strawberry as large as a peach? Perhaps you'd prefer to grow roses the size of dahlias. Or, the prospect of biting into an exotic new fruit or vegetable—a pomato or a cucaloupe—might appeal to you.

There's nothing fantastic about the creation of utterly new, bigger, more flavorful and nutritious plant foods. Nature is creating them all the time. The trouble is that nature has all the time in the world and if she takes a few million years to turn out a new kind of peach tree it's nothing to her.

In an ever-hungry world, nature needs to be given a hotfoot. Evolution must be given better pickup, quicker getaway. And our plant scientists are learning how to do it.

Everything you eat is the end result of evolutionary changes that are still going on as they have for billions of years. Our cereal foods are descendants of plain wild grasses. The Romans, who were supposed to be fabulous banqueters, knew nothing of potatoes, tomatoes, corn or grapefruit. They lived mostly on wheat, olives, grapes, dates, seafoods and now and then humming-bird tongues for variety. Some day our present diet may seem as monotonous as the Romans'.

The secret of evolution is locked up in germ-cells of plants and animals, inside the thread-like particles known as chro-

mosomes. Man has finally reached the stage where he is able to effect some wonderful changes in plant chromosomes by relatively simple chemical means. Plant hormones, which stimulate growth and hasten ripening, have proved successful in many instances. And a drug called colchicine shows great promise of opening fantastic paths in plant culture.

All new varieties of plants or animals arise from some alteration in their chromosomes. Such alterations can occur spontaneously. The yellow Delicious apple was an accident that happened some years ago to an isolated tree in West Virginia. The excited nurseryman who found it built a padlocked wire cage around the tree so its chromosomes would be his alone.

Something happened to the chromosomes of a fox, giving it a silvery fur of great beauty. The fabulously expensive fur known as platina is produced by descendants of that fox.

Employees of seedsman David Burpee sniffed seven million marigold plants before they found one free from the pungent odor some people find objectionable. A whole race of odorless marigolds has been bred from the smellproof chromosomes of this parent.

You have as good a chance as anybody of discovering a new oddity that nature chooses to hang upon some plant. Your own garden may produce a plant so superior to old varieties that plant breeders will pay a good sum for it. You may observe some



King-size cabbages like this will be common sights if scientists succeed in their plant evolution work.



Painting the growing points of plants with colchicine solution is one method of speeding growth.

shrub of astounding new virtue while walking through the woods.

It must be admitted, though, that your chances are less than one in a million. That's why science has been hunting so frantically for artificial methods that'll do the trick. Colchicine has proved to be one of the most effective methods of giving plant chromosomes a shot in the arm.

Prepared from the roots of the autumn crocus, colchicine is an old drug once used for relieving gout. It has the astonishing ability of preventing division of chromosomes in germ cells, yet of leaving the hereditary factors intact. It results in the number of chromosomes in colchicine-treated plants being doubled. This hopped-up heredity often leads to giant growth.

Even more important, colchicine frequently enables plant hybrids to become capable of reproducing themselves whereas crosses between species are usually sterile.

Seed catalogs list several varieties of colchicine-produced flowers that are bigger and sturdier than their parents. Thousands of home gardeners have raised them successfully. But scientists are more concerned about food crops. Since 1937, when Dr. Albert F. Blakeslee and Amos G. Avery

described their work with colchicine, large-scale experiments have been continuous. The aim is not merely giant size, but increased yield of specific plant products—more oil from soybeans, more latex from Russian dandelions and more resins from faster-growing trees.

Colchicine treatment is simple enough to be within the range of any intelligent gardener. Don't expect to create a football-sized potato immediately, however. But your experiments with the drug will be rewarding and thrilling.

The drug is listed in the U. S. Pharmacopeia as colchicine alkaloid amorphous. It's a yellowish powder, extremely poisonous. Great care must be taken not to get it on the skin or in the eyes as it can be very destructive.

The drug sells for about \$25 an ounce but an eighth of an ounce will be enough for many experiments. Water solutions of 0.1 per cent and 0.4 per cent are the strengths most commonly used and a one or 2-per cent mixture of colchicine in lanolin gives a paste for direct application to growing tissue. There are no fixed dosages for plants; the general rule is that too-strong applications prevent growth, too-weak



Burpee worker sprays young snapdragons with colchicine solution to create outstanding new varieties.



Here's a 32-pound turnip that dwarfs a 3-year-old child. Will all turnips in the future be this size?

ones merely daze the plant. One of the simplest methods of application is to soak seeds in colchicine solution between four and ten days, trying both weak and strong solutions. Use a very shallow dish so the seeds can get oxygen. Another way is to dig up seedlings when they reach the two-leaf stage, tie them gently into bundles and immerse them top down in a dish containing colchicine solution for from four to 24 hours. Keep the roots moist and set the seedlings into flats immediately after treatment.

A camel's hair brush can be used to apply colchicine solution in its weaker strength to tip buds of larger plants. This should be repeated several times at short intervals. A drop of the solution can be placed on the growing tip of seedlings three or four times at about six-hour intervals. Daubing on a single application of the stronger lanolin paste may do as well. Water solutions sprayed on by a fine atomizer can also be used.

You'll probably have a problem recognizing what you've got when you finally get it. Plants in which your chemical wizardry has taken, will probably disappoint you by their misshapen, unattractive ap-

pearance. Plant tissue poisoned by colchicine grows at a different rate from ordinary tissue. As the plant recovers, it looks pretty much like any other organism shaking off a hangover: generally undesirable. Often it'll have rough, crumpled leaves, thicker stems and greater height. The real benefits of doubling the chromosomes won't show up until the next generation.

With colchicine you might even be able to double the speed of growth of young shrubs and trees around your house. Nurseries calculate that their stock doubles in value with each year's growth. So, if you can grow a 20-year-old oak tree in ten years, you have a tidy profit in your front yard.

Professor Earl H. Newcomer of the University of North Carolina doubled the growth speed of young oaks and chestnut trees and hazelnut bushes. He placed one drop of 0.4 per cent colchicine solution on the growing points of the trees each day. Some of the seedlings died, but those that didn't started living really fast lives. Since many of our most important money crops like nuts and fruits come from trees, the commercial importance of a method that would cut the [Continued on page 145]

CALIFORNIA'S BIG SQUIRT





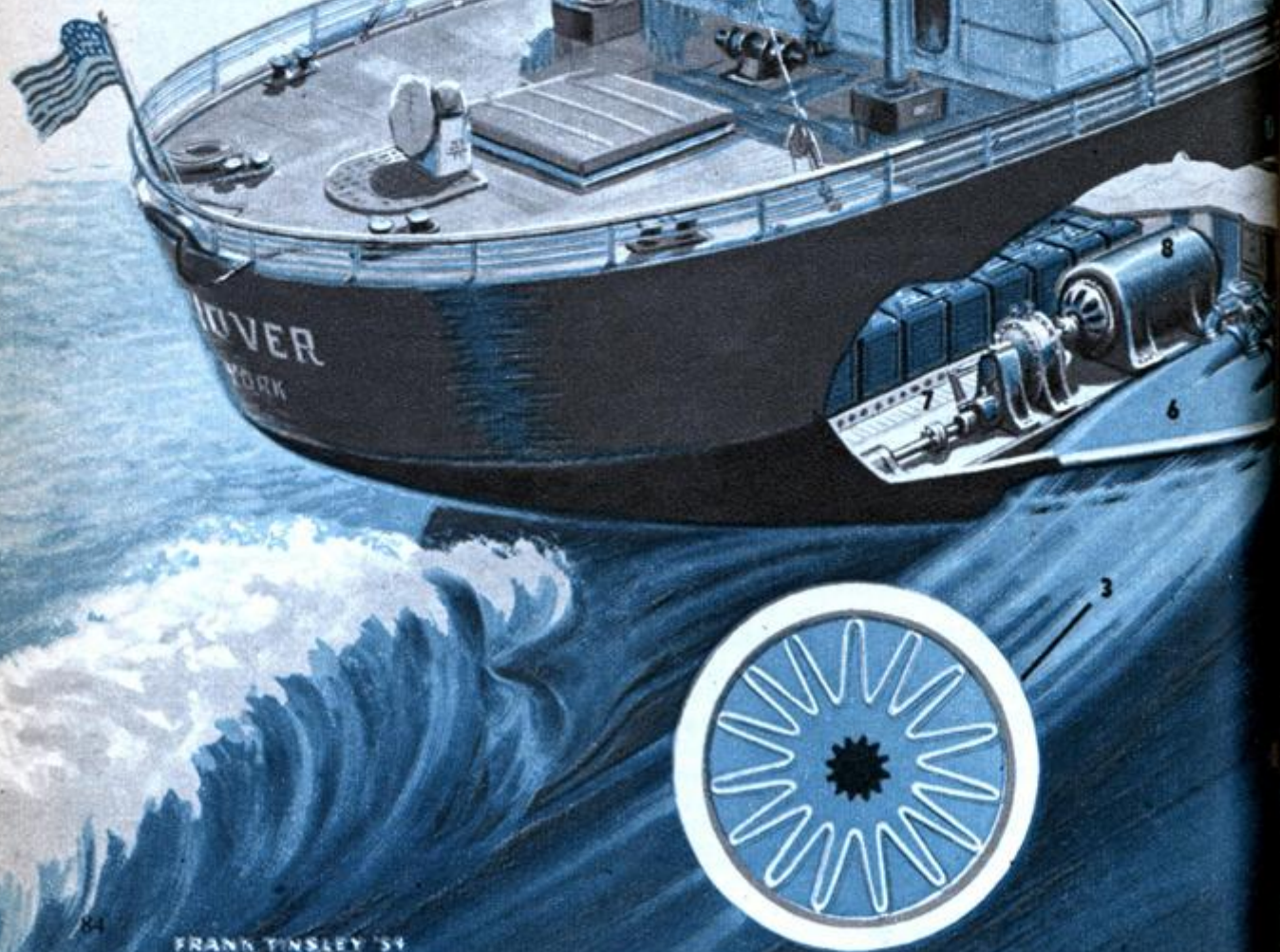
THE parched deserts of Southern California need water to transform their barren soil into fertile farmlands and tourist Meccas such as those existing elsewhere in the state. So far the problem has remained unsolved. But Sidney Cornell, a Los Angeles construction engineer, thinks he has a solution. He wants to construct a series of geyser-like power plants one mile apart to shoot water from the mouth of one into the funnel of the next, as depicted here by MI artist Frank Tinsley. The water would arc over hilly sections, have a flat trajectory over plains. Its velocity would approach 400 mph. These stations—400 in all—would cost about \$300,000 each. •

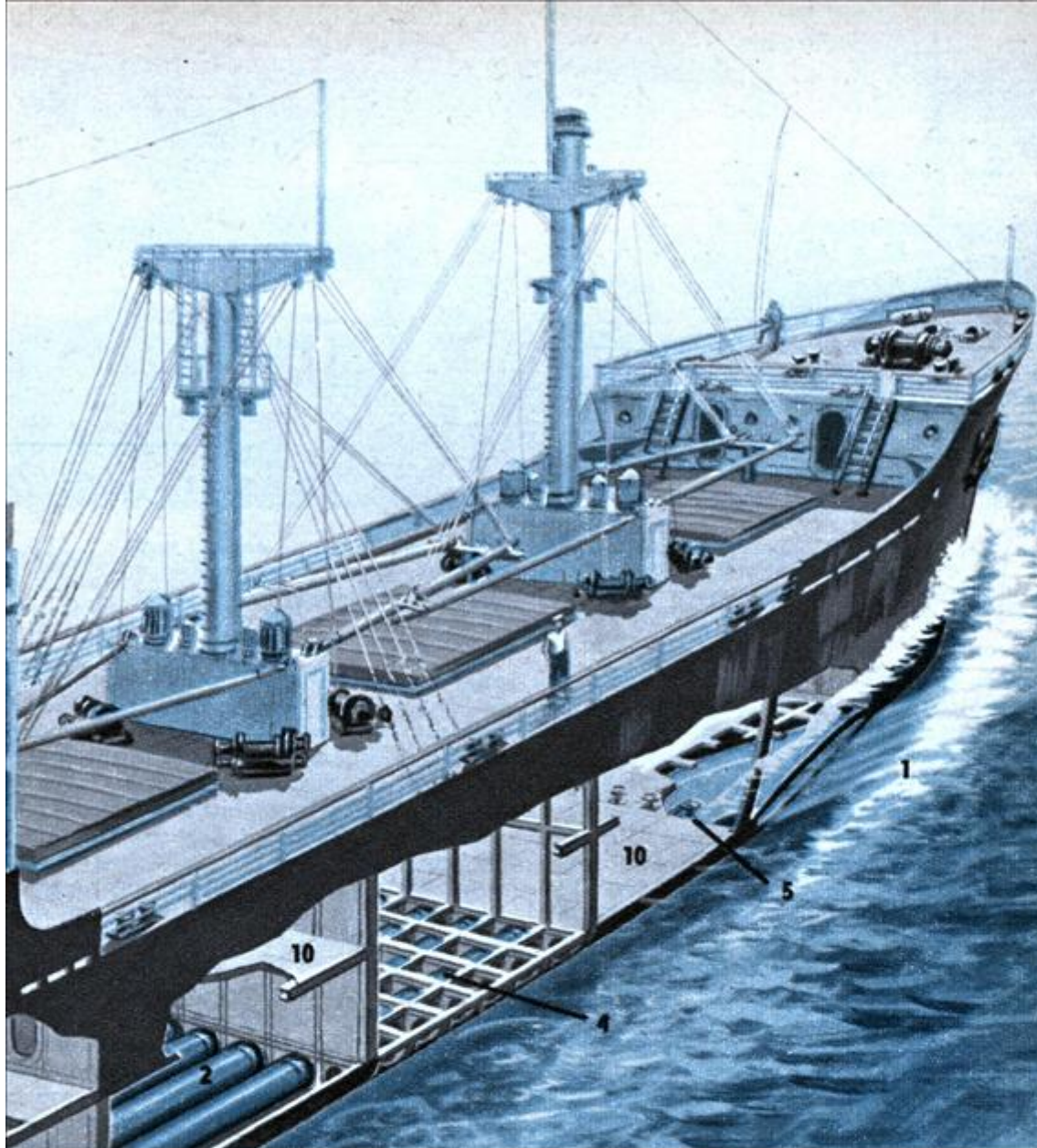
BOAT RUNS ON SEA WATER

KEY

BY FRANK TINSLEY

1. Salt water intakes in bow.
2. Brine runs through long, tubular wet-batteries.
3. Sectionalized view of battery tube showing central lead core surrounded by circular zinc plate, corrugated for maximum area.
4. Battery tubes nest between longitudinal members of hull.
5. Gate valves and pumps permit individual battery tubes to be shut off and emptied for removal and re-plating.
6. Salt water outlets in stern for through flow.
7. Direct current is stored in standard storage batteries.
8. Reversible, geared-down, electric motor drives propeller.
9. Direct control from bridge. No engine room signals necessary.
10. Full size cargo holds. No space wasted.

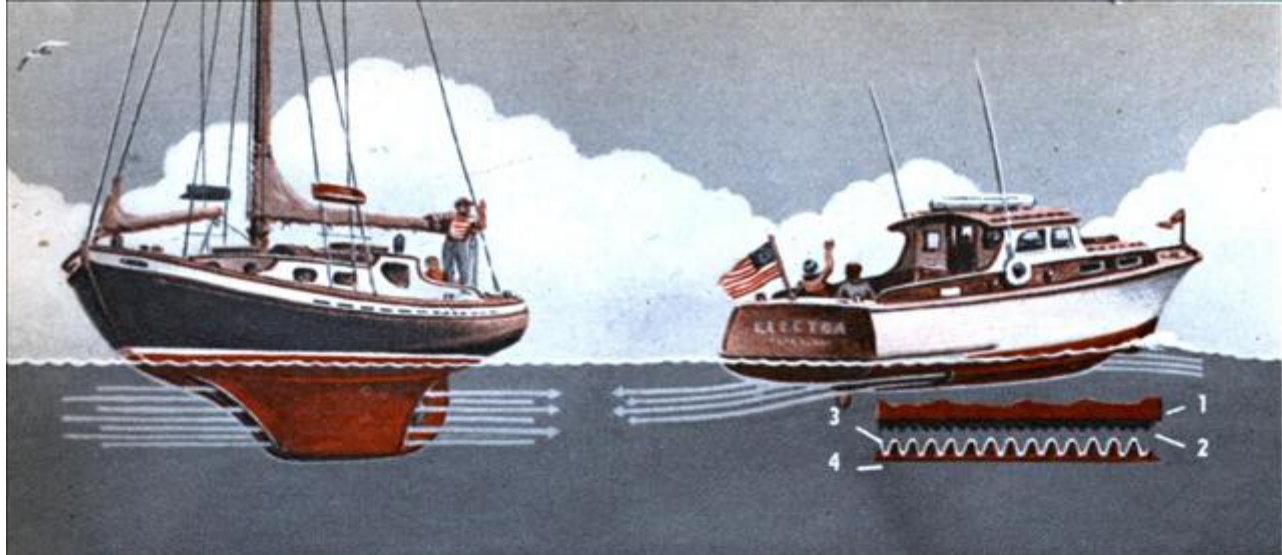




**Free, unlimited electric power from the salty sea
may soon replace gas, diesel engines in marine use.**

EVERY so often someone comes up with an idea so simple and apparent that millions of Monday-morning quarterbacks promptly kick themselves and mutter "Now why didn't I think of that?" Occasionally the idea is completely original. Usually, however, it is an old chestnut that has been kicked around until some bright lad finally dopes out a way to make it work. Ralph E. McCabe, designer and patentee of a practical, new salt water battery, does not claim to be the first to conceive the notion of extracting electric current from the ocean brine. He *does* claim to be the first to produce a seagoing wet cell that will pull enough juice from Davy Jones' locker to run a boat and haul a payload!

McCabe's battery is the result of no sudden stroke of genius. Since he first latched on to the basic idea back in 1948, he has slowly and painfully developed it to its present state of efficiency. During that time no less than 36 model boats have been built and tested at various points in the Atlantic, Pacific and the Gulf of Mexico. His latest



For use with smaller pleasure craft the sea-water battery can be mounted vertically on the sides of the keel or hung horizontally across bottom. 1. Keel or boat bottom. 2. Channeled lead plate. 3. Corrugated zinc plate. 4. Outer casing.

models, *Mamie* and the *Eighth Wonder of the World*, are each 21 in. long with a 4½-in. beam and they weigh 2½ and 3 lbs. respectively. Each produces a little over one volt and up to three amperes of current, enough to drive them through the water at speeds up to five mph. This, as any boatman can tell you, is quite impressive for a working model of that size. In addition to the propulsion motors, some of the models are fitted with electric lights, foghorns, etc., all operated from the same basic power source.

The theory behind McCabe's power plant is simply that of the familiar wet battery. The salt water of the sea acts as a conductor of the electric current flowing between a carbon-graphite positive plate and a nickel-zinc negative plate. This current operates a D. C. electric motor which, in turn, drives the boat's propeller. The plates are corrugated or grooved to provide increased working area without increasing their overall dimensions.

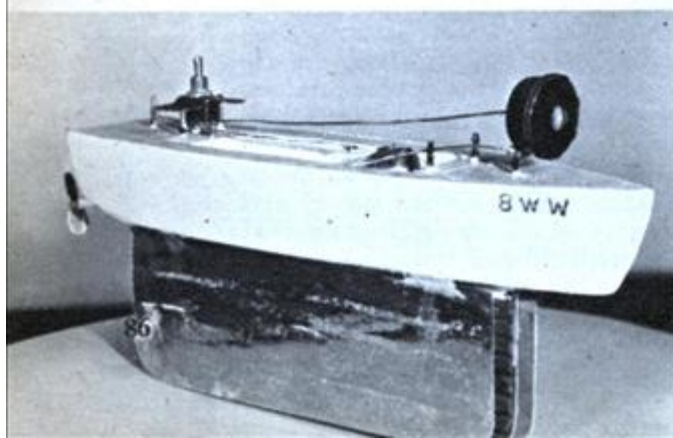
Some of McCabe's earlier models stalled

after a short run due to the polarization or "balancing" of the ions. Eventually this difficulty was overcome and his latest boats have ticked along steadily until the motor brushes or armatures became dirty—a running time of five-and-a-half hours and a distance of some 20 miles. After cleaning they promptly took off again as strong as ever. With stand-by motors and facilities for automatic changeover, there is no reason why such a power plant should not run indefinitely.

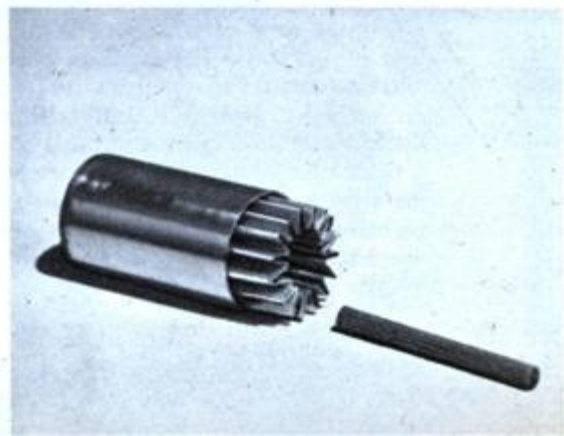
McCabe has applied his boat-battery principles to a newly patented flashlight cell which he hopes to have on the market this year. Circular in section, it embodies a grooved carbon-graphite positive rod in the center surrounded by a cylindrical, zinc negative plate, deeply corrugated for increased area. He states that this new arrangement produces twice the amperage of the present cell of similar size and lasts twice as long.

The dry cell set-up, shown in the diagrammatic insert [Continued on page 216]

This 21-inch working model, the *Eighth Wonder of the World*, runs for more than five hours at better than 4 mph using plain sea water as "fuel."



McCabe's newly-patented flashlight cell employs a grooved carbon-graphite positive rod in center, corrugated cylindrical zinc negative plate.



Boat Runs On Sea Water

[Continued from page 86]

in the lead illustration, suggests an efficient wet battery arrangement suitable for large, seagoing freight and passenger ships. Encased in long tubes stretching fore and aft between the longitudinal bottom members of the conventional double hull, the batteries would occupy the space now used for fuel-oil tanks. Subsurface intakes on either side of the bow admit seawater to the battery tubes in a through-flow system that exhausts it from exit vents beneath the stern. The moving water, with its constant saline content, forms a perfect electrical conductor. The current thus generated is fed into banks of storage batteries from whence it can be drawn in an even, steady supply to operate the ship's propulsive motors and auxiliaries. Such a power plant can be controlled directly from the bridge with no engine room telegraph necessary. The D.C. motors are instantly reversible under full loads, eliminating heavy reversing gear and increasing the vessel's maneuverability.

Assembled in short, quickly detachable sections, the battery tubes are easily accessible for cleaning, repair or replacement of worn electrodes. Individual pumps and gate valves, fore and aft, permit any particular battery to be closed off and drained without affecting the others. With a few extra units built in for reserve power, the ship can proceed at normal cruising speed while repairs are completed. At the voyage's end, plates can be readily pulled and replaced without the necessity of dry-docking the ship.

Similar sea-water battery arrangements can be adapted to small pleasure craft. As shown in the diagram atop page 86, they can be hung in sheet form on either side of a sailing yacht's keel or spread horizontally across the flatter bottoms of motor cruisers. While the original investment in generating and storage batteries, motors and wiring would undoubtedly equal or exceed the cost of an internal combustion engine with its exhaust pipes, plumbing, tanks, etc., the elimination of dangerous and expensive fuels, engine vibration, noise and mechanical reversing gear would make it well worth while in the long run. It would certainly be far simpler, more easily controlled, lighter and more dependable than today's cranky power plants.

McCabe feels that while he has developed his sea-water battery to a fairly efficient stage there is still plenty of room for improvement. He hopes, therefore, that some of you MI readers will pick up the ball and carry it a few yards further, "as the amateurs did in the

radio field." With this in mind he offers a free permit to use his improvements in advanced experimentation and will be glad to discuss plans and procedures with any interested amateur. His ideas, however, are patented and can not be used commercially without specific permission.

To encourage their continued development, McCabe plans a series of sea-water-powered boat races late this summer. He explains that initial battery experiments can easily be conducted in the family bathtub if two or three per cent of salt is added to the water.

The basic idea seems perfectly valid and you may get in on the development of a brand new form of marine propulsion—free electric power from the seven salty seas! •

King Of Cymbals

[Continued from page 100]

as 15 years. Many thousands now are curing in the Zildjian vaults. About 20,000 are sold each year. Artists such as Gene Krupa, Shelley Mann, Lionel Hampton, Cozy Cole, Louie Bellson, and Boston Symphony, N. Y. Philharmonic and Metropolitan Opera Co. players appear in person at the plant to select their instruments. Prices range from \$7 for the smallest, 7-inch cymbal to \$108 for the largest, 28-inch cymbal. Gongs, better than the oriental, cost \$132 each.

No two cymbals have the same sound. They vary from 15 to 20 thousandths of an inch in thickness. There are 14 varieties: fast, fast-crash, crash, splash, swish, bounce, bebop, hi-hat, flange hi-hat, ride, finger, concert band, brass band and symphony. There are 25 different ways of playing each.

Avedis has two sons: Armand, the factory manager, and Robert, sales manager. Robert is the younger. Armand has three daughters and the absence of a male descendant caused much worry to the Zildjian household till two years ago when his wife presented him with a son to inherit the secret.

Armand tests all cymbals for tone before they leave the plant and plays in a local band for amusement. Avedis, an expert player himself, and Armand sometimes lock themselves in the curing vault and treat themselves to a concert.

The firm is so unique that it receives much unsolicited publicity. One night while listening to the radio, the Zildjians were startled by the words, "Like the name Avedis Zildjian on a cymbal, the name of DuPont is your assurance of the utmost in quality." A well-deserved and significant compliment.

Copter Cops

By Frank Tinsley

TODAY'S high-speed turnpikes require ground-bound traffic police to take to the air and graduate to the status of "Copter Cops," mounted in a vehicle that could speed safely above the car-choked roads and provide a bird's eye view of driving conditions and dangers. Such a vehicle could go far beyond the utility of the present patrol car. It could control traffic speed, clear jams at bottle- [Continued on page 152]





Helicopters for Everybody





The Hoppicopter is evolving into a comfortable single-seat helicopter that will supply you with cheap air transportation.

By Frank Tinsley

BACK in the 30's, a Seattle aeronautical engineer named Horace T. Pentecost became convinced that he could design a set of personal wings. As an engineer and student of aviation history, Pentecost was well aware of the shortcomings of man-made flapping wings, so he gave the problem an entirely different solution. In place of rosy pinions, he substituted the whirling blades of the modern helicopter.

His first machine, designed for army

paratroopers, was intended to supplant the clumsy and uncontrollable parachute. Strapped to the wearer's back, it was christened "Hoppicopter" because the trooper literally hopped off and landed on his own two feet. It consisted of little more than an engine, rotors and control stick, mounted on a tubular frame that was strapped over the flier's shoulders and back.

The Hoppicopter's dependence upon human legs as landing gear proved its



Second version of the Hoppicopter design had a tripod landing gear with motor mounted behind the pilot's head. It was better than the original "back strap" model but weight distribution was unsatisfactory.

ultimate undoing. Landing on rough terrain, the wearers frequently stumbled and fell, smashing the whirling vanes against the ground. This was not only embarrassing but expensive.

The next model boasted a light tube-and-canvas seat and three landing wheels arranged in a triangle, supported on spindly, insect-like legs. In flight, the pilot felt somewhat more at ease, not as though he were hanging in space like a fish on the end of a line. The working parts were unchanged, however. A hot, noisy motor still nestled coily against the back of the pilot's neck. The gas tank was suspended directly above him with no fire protection.

The third model has corrected some of the above mentioned faults. The engine

now is slung under the seat directly beneath the center of gravity. This warms the pilot in cold air and improves the machine's balance. The model at present is being tested. There still remains, however, the sense of insecurity—of riding a flying swivel chair with no visible means of support. Pentecost and his associates are perfectly well aware of this natural reaction and have planned a weatherproof enclosure for the machine.

In the illustration one version of such a streamlined housing is shown. With this addition, our Hoppicopter becomes a vehicle of true utility. Such a machine would be practical, cheap to buy and maintain and could easily be the answer to the demand for a "Model T" helicopter. •

Pentecost prepares to start his engine by spinning it with a starter cord in the flywheel's base.



Present model, the third, has the engine situated under the pilot's seat. This gives it better stability.



Why Don't We Have... **CRASH-PROOF HIGHWAYS**



... with automatic pilots to take the wheel
for trip-weary, accident-prone drivers.

By George W. Gibson



IN this age of flying saucers and 600-mph aircraft, automatic pilots are accepted as being very commonplace . . . for airplanes. But why not automatic pilots for autos?

If an inventor should offer the motorist an automatic pilot for his car, consider the tremendous safety value of such a device. The human element would be eliminated from driving. Our highways would become virtually crashproof.

Here is a system based on magnetic detection—(similar to that used to locate land mines in World War II) and radar, since it would be impractical to use radio beams as a means of directional control as with aircraft.

A ribbon of metallic material approximately 12 inches wide is located in the center of each highway lane and would have been incorporated in the highway concrete as it was poured.

The automatic pilot needs the following equipment: two magnetic detection units, a radar unit and an engine governor. This unit would work in conjunction with the car's power steering and automatic transmission. The detection units would be mounted under the nose of the vehicle, one on each side of a horizontal line running lengthwise through the body. The narrow-beam parabolic reflector of the radar antenna, en-

closed in a streamlined plastic housing, would be mounted on the roof or in the nose of the vehicle.

The car is put in motion in the conventional way and driven down the highway centered over the metallic ribbon. The auto-pilot is switched on and the magnetic detection units immediately begin reading the strength of the magnetic field surrounding the metallic ribbon in the pavement below. When the front center of the car is directly over the ribbon, signals transmitted to the power steering device from both detection units will cancel out and the wheels will remain straight.

However, should there be a turn in the pavement, the metallic ribbon will also follow the turn and the signal transmitted by one detection unit will increase while the signal from the other will decrease. This will actuate the power steering and the wheels will turn in the direction of the stronger detection signal until the car is centered over the ribbon once more. Having made the turn, the car will straighten out by the same process.

The degree of turning by the steering unit will depend upon the signal-strength increase transmitted by the detection unit.

The radar antenna transmits a narrow beam which constantly sweeps an area from one boundary of the vehicle lane to the other and continuous indication is obtained of all objects directly in the path of the car such as bridges, sharp curves,

dips or obstacles in the road.

Let us assume, for example, that a cruising speed of 50 mph has been established and set up on the control panel. The engine governor will maintain this speed by increasing or decreasing the amount of gas being fed to the engine in response to varying engine loads.

After cruising speed has been set on the control panel, changes in the speed are brought about only by the driver's overriding of the auto-pilot or as the result of a signal from the radar unit.

Suddenly our car begins to overhaul a slow-moving truck. As soon as it reaches a certain distance from the truck—a minimum safe distance—the signal received from the radar beam bouncing off the truck causes a warning buzzer to sound. In addition it causes the governor to slow the engine of the car to the speed needed to keep that distance.

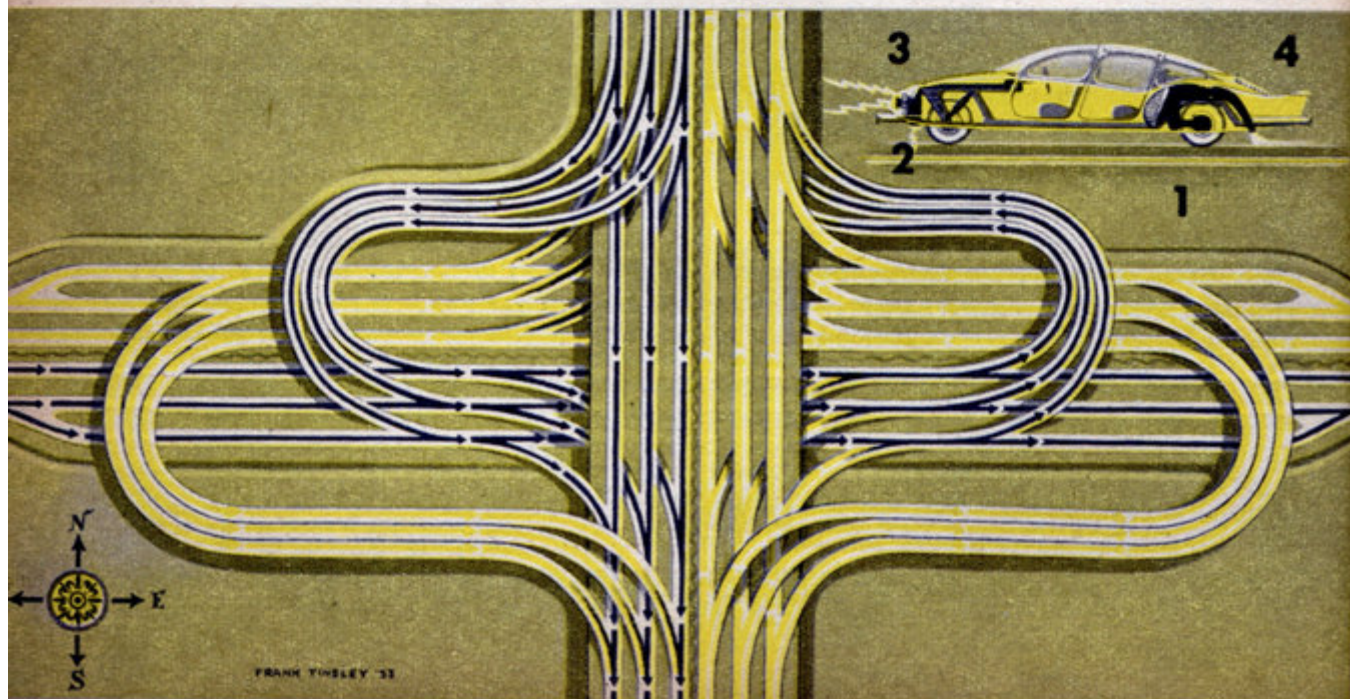
To pass, the driver must over-ride the auto-pilot and control his car manually. When he is once more on-the-beam and his radar unit is silent, he can relax.

To turn off the highway, he must override his pilot once more.

Each hazard on the highway will have a small radio transmitter located near it. As the car approaches, the radar beam trips the radio transmitter causing it to emit directional coded signals which designate the safe speed for passage through the hazard. Upon receipt of these signals, our radar receiver [Continued on page 184]

MI artist Frank Tinsley envisions this auto-pilot highway. Center lines of road-lanes indicate magnetic strip. No car can leave lane, pass, overtake the one ahead. Each is metered into or

from line of traffic alternately. Diagram shows cable (1), detector (2), radar unit (3). As drawing shows on previous page, helicopter patrol brings fuel, service and first-aid to the stranded motorist.



AMAZING
MARVELS
OF TOMORROW

CROSS-COUNTRY



CRUISE SHIP



Rolligon trains will open many inaccessible areas to pleasure travel.

*You'll be riding on air—
squashy bags of it
that roll happily over
every obstacle.*

By Frank Tinsley

THE crazy, mixed-up amphibious train shown on this page, half bulldozer, half river boat and all Tom Swift, is only an adaptation of a vehicle now being operated experimentally by the Army.

The rolligon wagon rolls slowly but implacably on a number of limp blimps—sausage-like air bags without much air in them. These saggy bladders are a vast improvement over the wheel when it comes to moving things over sand, muck, rocks and rubble. For several years



Superstructure modifications make the cruiser perfect for traversing arctic or desert

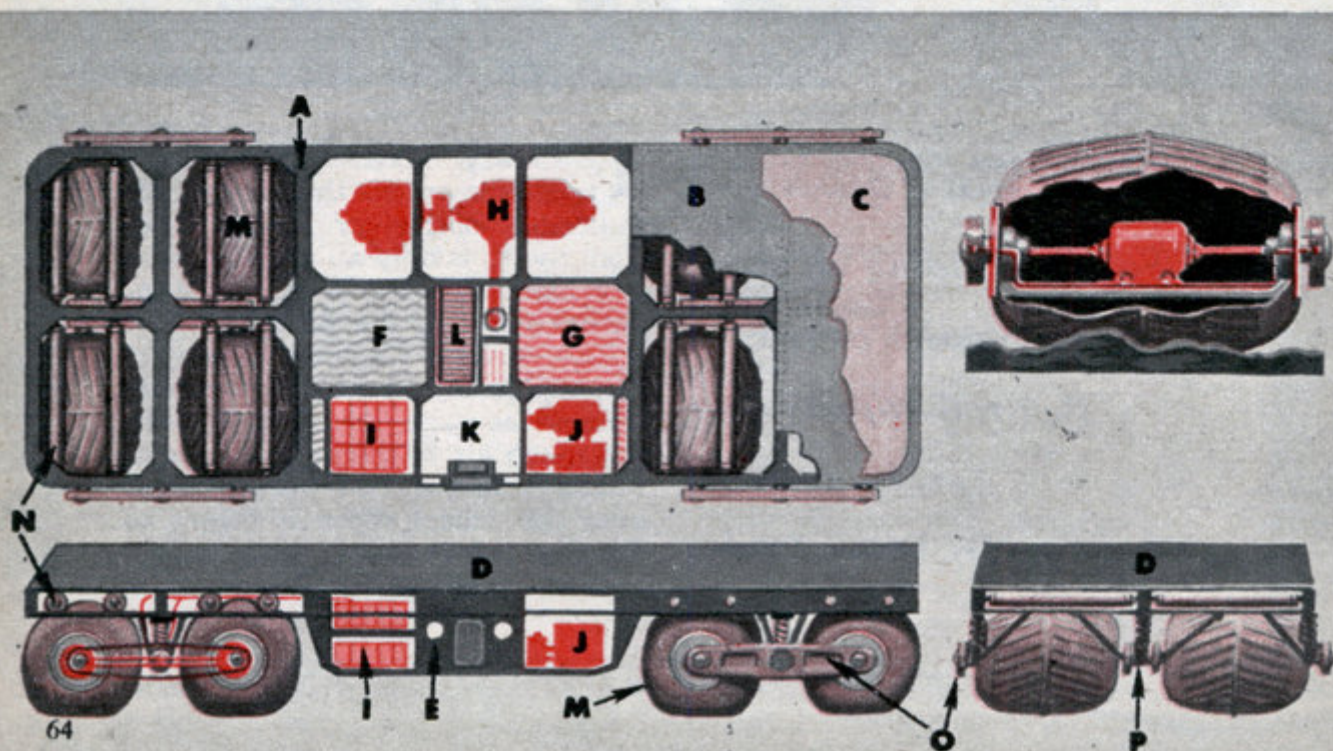
the boating public has been using low-pressure rollers for moving boats on every type of ground.

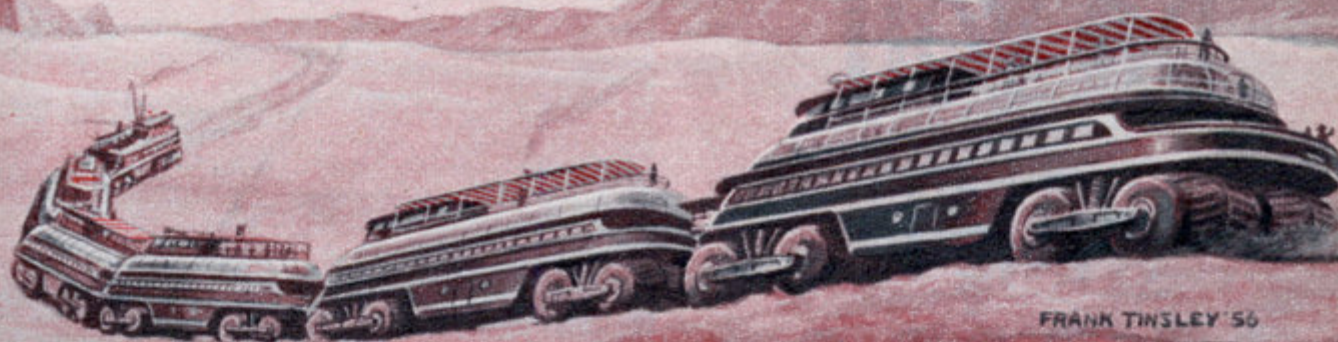
Rig your rowboat so that it rolls *with* the air bags instead of *over* them, put in some kind of power plant and you have a rolligon vehicle. The Army has done this; in fact, it has put a five-ton truck on rolligons and driven it where tractors fear to tread. Not only can you drive it easily over a field of king-size rocks but where other vehicles sink to the hub

caps, this one rolls over muddy terrain with ponderous aplomb. The air bags spread the load so evenly you can drive your five-ton job over a bevy of sunbathers with no more than appreciative grunts from the victims: servicemen and women who have tried it say it's like a nice, beefy massage.

The rolligon was made available to modern surface transport by an ex-mission school teacher named William H. Albee who learned about it from the

Below, details of MI's cross-country rolligon cruiser: A. Chassis; B. Watertight steel deck; C. Cork flooring; D. Watertight hull; E. Engine room; F. Water tank; G. Fuel tank; H. Diesel generator; I. Battery room; J. Air conditioning; K. Entry; L. Hinged staircase; M. Rolligons; N. Frame supporting rollers; O. Rolligon positioning arms; P. Tripod rolligon arm supports.





wastes. It could be plastic-canopied for polar sun bathing, air-cooled for the Sahara.

Eskimos. Albee's stone-age students up on the Bering Strait use inflated seal-skins to overland their big umiaks—medium-sized barges covered with skins and often loaded with five tons or more of walrus meat.

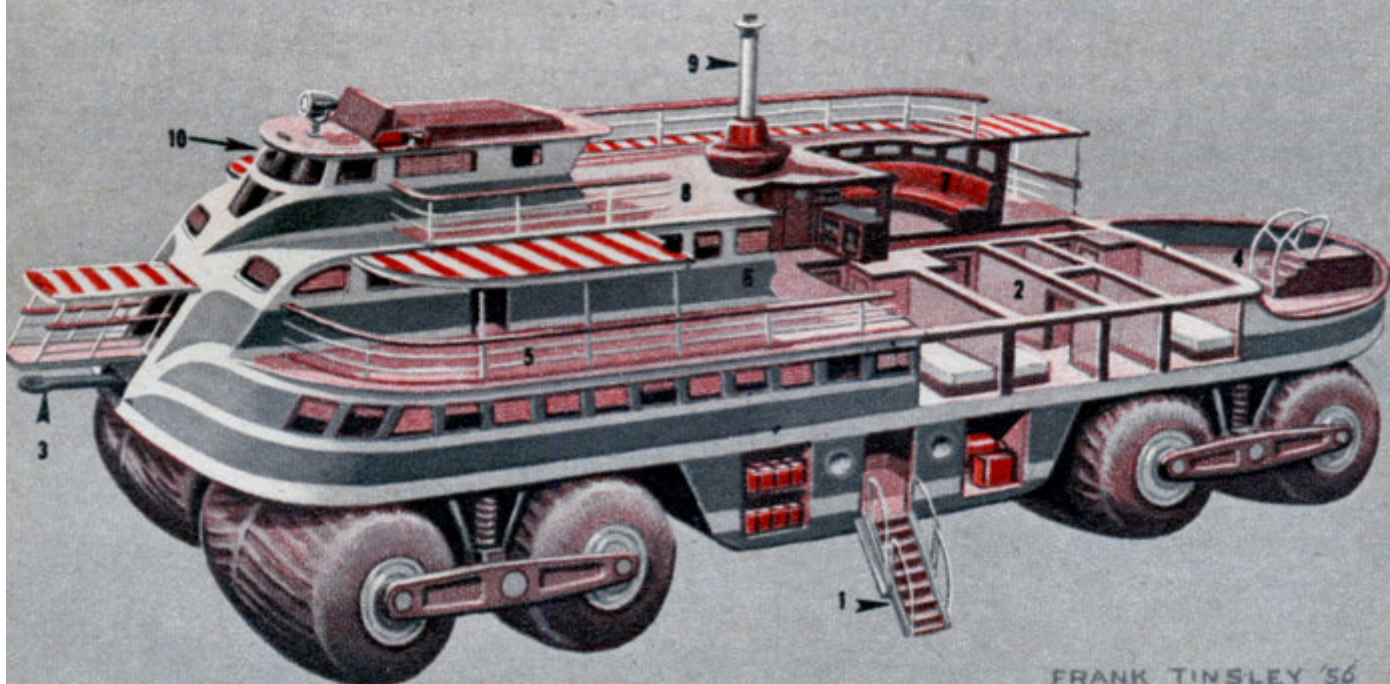
In the accompanying illustrations MI has tried to visualize a modern use of Albee's concept for you. Basically, the machine is an amphibious, off-the-road weight carrier, with a shallow, barge-like chassis and a central, underslung

power compartment.

In this MI design, an electric drive has been selected, with motors mounted inside the rolligon hubs. Current is produced by a diesel generator unit in the watertight power compartment.

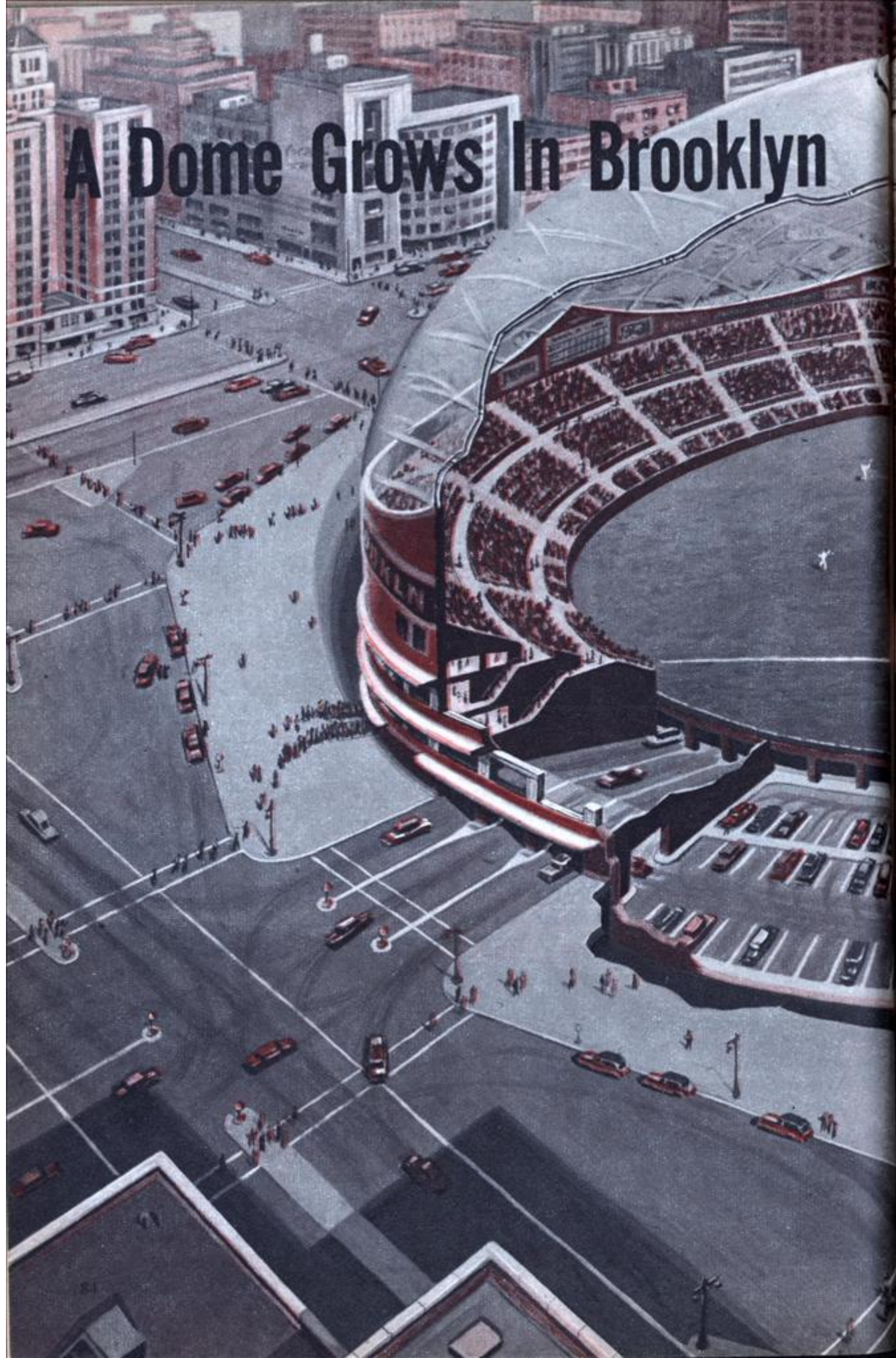
This is MI's concept of a rolligon cruise ship. Whatever form the rolligon eventually takes, there can be little doubt that Bill Albee's squashy, Eskimo airbags have provided mankind with a radically new form of transportation. •

Below, cutaway view of passenger cruiser: 1. Entry: steps retract into watertight deck; 2. Lower deck: gangway and staterooms; 3. Gangway and coupling; 4. Afterdeck, gangway steps; 5. Promenade deck; 6. Upper staterooms opening on promenade deck; 7. Lounge and bars; 8. Sun deck; 9. Air intake, diesel exhaust stack; 10. Pilot house, crew quarters, stairs.



FRANK TINSLEY '56

A Dome Grows In Brooklyn





*The Dodgers' home games
may soon be played under
this huge plastic bubble.*

By Frank Tinsley

MCHANIX ILLUSTRATED takes pride in being the first to show what the Brooklyn Dodgers' new baseball park may look like—if the 20th century's most daring architect gets his plan accepted. Buckminster Fuller has already earned the gratitude of the armed forces and the taxpaying [Continued on page 162]

Brooklyn's new sports center may look like this if architect Fuller's plan wins.

**COVER
STORY**



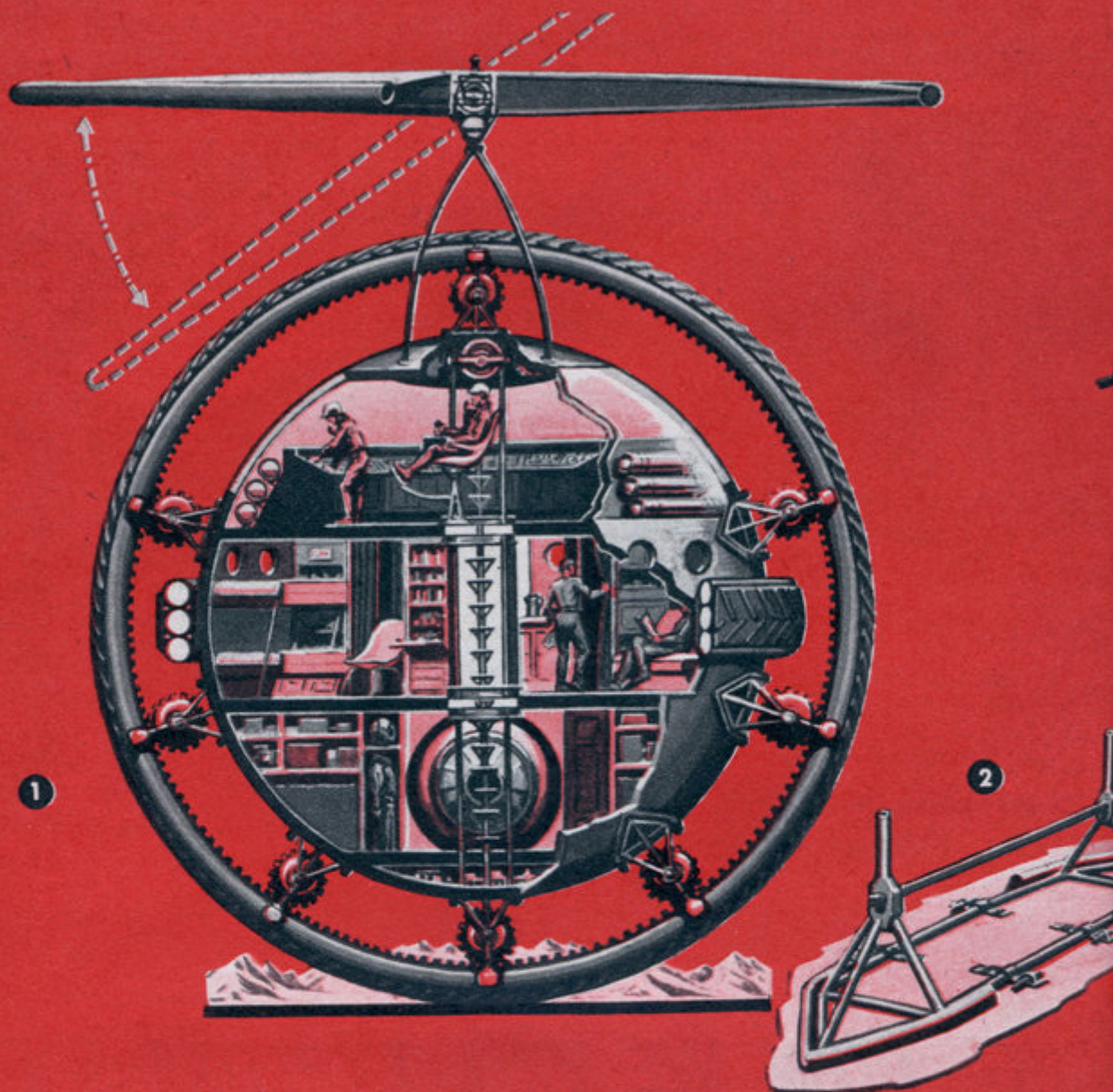


HOW WE WILL EXPLORE THE MOON

An original MI design by FRANK TINSLEY

EARTHMEN who land on the moon will need a special lunar vehicle for exploration. The vehicle must be self-sustaining and capable of traversing both the smooth, dust-paved crater beds and climbing the steep rocky passes of their mountainous rims.

MI's design for this difficult job is a giant Moon Explorer unicycle with a spherical body mounted inside its rolling rim and composed almost entirely of inflated fabric parts. These constitute the lightest possible structure and can be easily disassembled and deflated for storage. *[Continued on next page]*

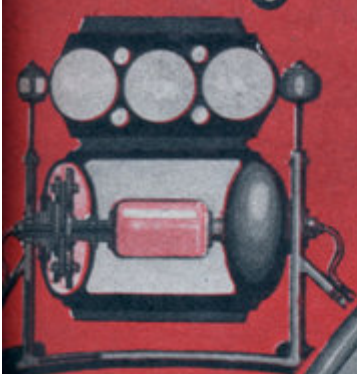


MOON EXPLORER diagram: 1. Sectional cutaway shows triple-deck arrangement, tilting power parasol, spare tire and drive-drum installations on the inner rim of the wheel. 2. Drive-drum mounting is made of welded, lightweight tubing. Simple latch fastenings secure it. All mountings are interchangeable and, disassembled, nest for easy transport.

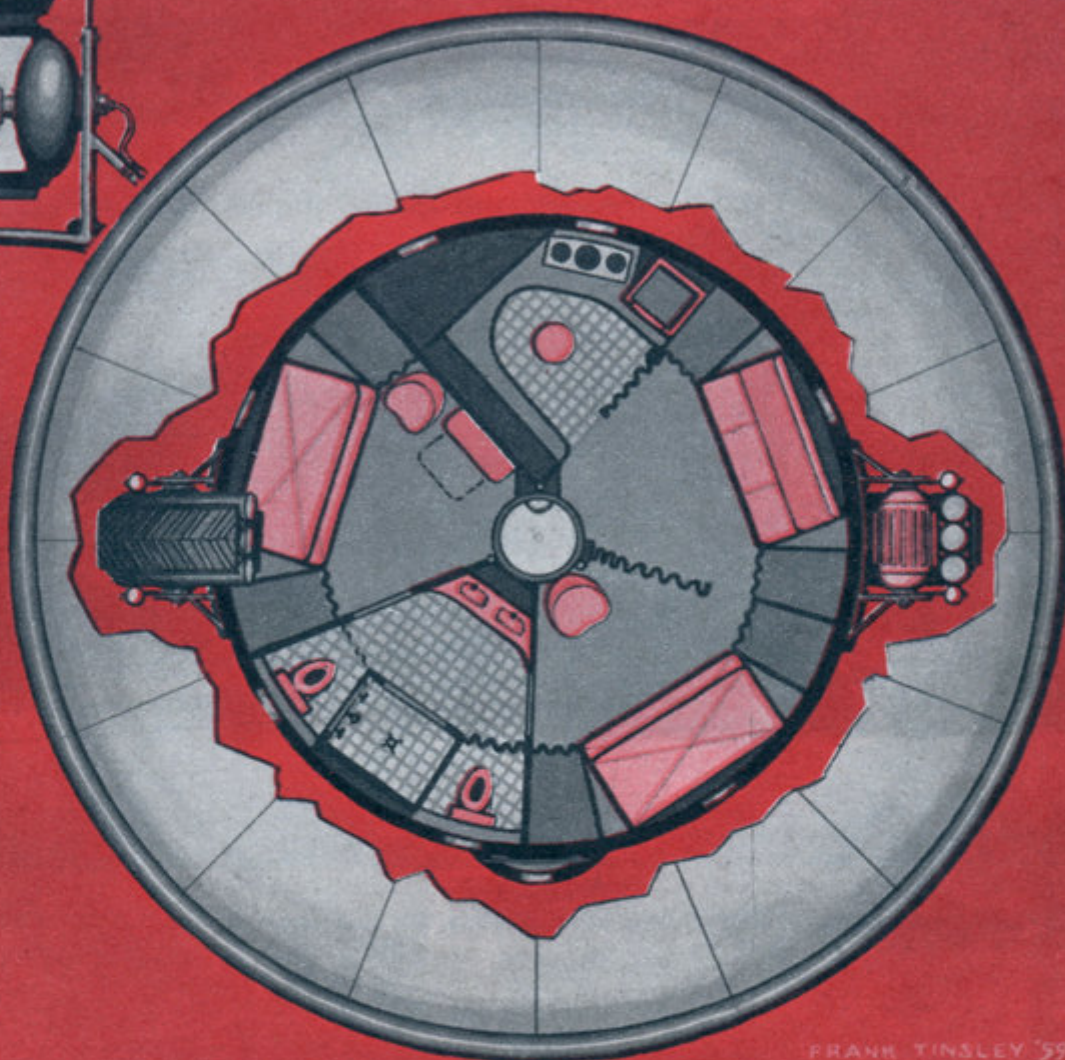
The Moon Explorer is 32 ft. high. It is driven by electric motors and stabilized and steered by gyroscopic tilting. Power is derived from a circular "parasol" faced with solar batteries that always face the sun. Those atop the disc are of the light-actuated type. The bottom units are thermal generators, extracting electricity from reflected ground heat. This arrangement uses every inch of area and constitutes a

simple, long-lived generator with no moving parts. It not only produces free power but also serves to shield the vehicle's body from the burning rays of the unfiltered lunar sun. Despite its large size, the parasol is extremely light in weight. It consists of an envelope of thin, inflated fabric, stiffened by internal spokes and a rim of inflated tubing. It is carried above the wheel tread on four light magnesium legs and mounted

3



4



FRANK TINSLEY '59

3. **POWER DRIVE** unit. Axle-mounted electric motor's reduction gears are in oil-filled casings. Power and air cooling lines enter via either end of hollow axle. 4. Top view, central access well connecting all levels and cabin arrangement with individual lockers, berths, etc. Off-duty men sleep in private compartment. Note private head and shower.

on a ball-joint so it can be tilted to any angle. An electric eye, linked to gyros in the hub, controls its movements automatically.

The rotating wheel is a self-driving tire. It is made of inflated tubes, faced on the outside with a cleated tread and on the inside with driving lugs. The wheel is driven by inflated terra-tire units, powered by internally mounted electric motors and is kept in place by

inflated ball-bearing guides. The bottom five power units act as drivers and the upper three as idlers. All are fitted with motors and are interchangeable. They are mounted on light metal frames which carry power and air-cooling lines into them through the axles. A spare wheel is carried around the vehicle's body, inflated to act as a bumper in traversing narrow defiles, etc. For convenience in [Continued on page 152]

Follow That Man

[Continued from page 63]

moving up to 10 or 15 yards behind his man. Whenever a person fears a shadow, he tends to look behind him. In such cases advance shadowing comes in handy.

As always, a good foot shadow job is done best with at least two agents when dealing with a subject traveling on buses or subway trains. A careful subject may either wait until the last second to get in a vehicle or will jump off just as the doors are closing. If necessary, one shadow drops off rather than act suspiciously. The same strategy applies to movies. Only one shadow follows a subject inside. If the subject tries to slip out in the dark, he's still not clear.

However, foot tailing is extremely difficult and requires men who know all the angles. Naturally, even the best shadow in the business may lose a subject. What separates him from the tyro is that he doesn't panic and uses his knowledge of the subject in an effort to relocate him.

One of our operatives lost his man just around noontime recently and yet found him within 35 minutes, several blocks away. He knew two things about his man—he loved Chinese food and he was left-handed.

Since it was near lunchtime he began checking Chinese restaurants in the area. At the third one the operative noticed a table where the diner had evidently stepped into the washroom between courses. On the table was the brand of cigarettes the subject smoked and an open book of matches. The matches had been stripped from left to right rather than right to left as a right-handed person would do. Our operative sat down in a nearby booth and happily ordered egg foo yung.

Chalk comes in handy if the subject suddenly gets into a car. Chalked taillights stand out like a sore thumb at night. Striking a match that has been rolled in melted wax is also a good night-time signal for a shadow to tell his partner to move up. The wax will treble the flame and keep it burning in any weather for a few seconds.

In his car the Chinese restaurant agent has quite a collection of items so that he can step out in several different disguises. He keeps a briefcase, a lunch pail, a battered hat, a ripped work jacket and a few

empty beer bottles so that he can pose like a guy out shopping. His prize, however, is a loud sportshirt. He once started tailing a subject in New York in winter and wound up two days later in Florida. The sportshirt gave him the native look.

The one big point in a shadow's favor is the fact that very few people can remember a face. As long as the shadow stays nondescript and blends with his background, he's safe.

Dutch Schultz was once being tailed by New York police officers. A moll tipped him off and Schultz, suspecting they were rival gunmen, led his boys out of his plush Fifth Avenue hangout for a street gun battle.

Arrested, Schultz was released and sneered at the police: "That'll teach you guys to keep off my tail." He paraded off, unaware that he was once more being tailed.

And the same could be true of you right now. Are you being followed?

Let's face it. You wouldn't know! •

Exploring the Moon

[Continued from page 77]

assembling, these wheel units are built in two sections, joined by belt-lacing type fasteners.

The Explorer's body is a double-walled sphere of plasticized fabric, reinforced by floors and vertical tubing. The tough outer skin is designed to resist cosmic dust and the abrasions of ordinary wear and tear. Its exterior is radiantly painted for maximum visibility. The inner skin is stressed to take the normal atmospheric pressures of earth. Between these walls is insulation to protect against heat, cold and harmful radiation.

Lightweight floors of honeycomb structure divide the interior into three decks. The upper level, enclosed in clear plastic, is the operating and surveying bridge. It is ringed with instrument panels and fitted with searchlights, mapping cameras, etc. On either side of a central well connecting all levels, are seats for the commander and driver. These have a clear view in all directions.

Around the rim of the bridge deck, partially exposed to the sun, is a three-tube hydroponic garden in which algae are grown in a circulating nutrient solution.

This installation operates on the principle of the balanced aquarium, absorbing carbon-dioxide, moisture and body wastes given off by the crew, and producing fresh oxygen in its place. The algae multiply at a rapid rate and, having a high protein food value, are used in conjunction with other rations. The vehicle thus produces its own fresh air and food.

The middle deck contains living quarters. There is ample room for the crew of six. A bathroom and galley are conveniently located and supplies of concentrated food are stored here. Books, record players and TV—picked up from earth satellites—provide recreation. Movies may be shown, if desired.

The lower deck is the hold. Here are carried supplies, spacesuits in lockers, water tanks, oxygen apparatus, etc. On either side of this level is a spherical air-lock built into the outer walls. Space-suited crewmen can enter or leave on outside reconnaissance patrols through the air-locks. As air is precious, provision is made to save the atmosphere exhausted from the locks so it can be constantly reused. This is achieved by special pressurized tanks.

This is MI's solution to the problem of exploring planets and satellites. It may seem early to be thinking about such matters but at the rate we are closing the gap to the moon, who knows? It could happen tomorrow! •

McCahill Tests Peugeot

[Continued from page 90]

outstanding by far. For example, every 403 sedan comes equipped with a sliding roof, heater and defroster, windshield washer, two sun visors (one with a vanity mirror on the up side), a ceiling light that operates by door or direct switch, built-in roof rack sockets, seats that can be reclined independently or together in the best French tradition and converted into beds. In a couple of words, this job is really loaded with accessories at no extra cost.

Some of the other items include variable instrument lighting, an electric clock and a real honest-to-God water temperature gauge. The glove compartment is ample. Another now-rare feature on the Peugeot is a hand crank, a useful gadget that disappeared from most cars along with

Frank Merriwell's fast ball. A hand crank is a godsend for mechanics in tuning and it could even help an owner over a rough spot when his battery goes *Poof!* The horn ring also has a nice twist: a light touch produces a pleasant city sound and a heavy touch makes it blat like the village fire horn for clearing cattle off the turnpike. Most of the trim is stainless steel. The Peugeot also has a trip meter, which most GM cars can no longer afford. Any way you approach this rig it's truly well equipped and, from a merchandise-per-dollar standpoint, it has its closest rivals welded to the flagpole.

Just in case you're getting the impression that my DeGaulle buttons are a little too tight, there are some things about the Peugeot that you can toss right back in the lap of Louis XIV. For example, the wheels have only three lugs. Though these may be enough, and though they claim they have never had any complaints on this score, to this bald-headed scribe four lugs are better and five would be better still for extra strength under emergency conditions, such as getting into a broadslide on dry pavement or slapping an extra high curb at an angle.

The transmission is an excellent four-gear affair but the shift pattern is enough to send One Cell Nellie to the rubberized looney bin ahead of her time. To shift, you wig-wag the lever like a delinquent Boy Scout who went swimming in a rum barrel. First gear is back at your bellybutton and second is pretty conventional—down a notch and forward—but then you come back at your bellybutton again to get into third. Fourth is still farther down and ahead, one notch lower than second. You'll get the hang of it but don't be surprised if you miss a few times.

The foot room is scanty, like an economy-size broom closet, but typical Detroit. Though I didn't actually fill the cab with water and measure the volume, I feel safe in stating the Peugeot has more interior room than any of the other imports selling in its class. One more rustic touch with a Parisian accent is the unpadded ceiling. Rear-seat passengers, on encountering extreme bumps, can easily build a series of molehills in the outer roof, if their skulls don't give way first. McMichael, admittedly built on king-size lines, almost shot his ears into orbit while trying out the rear seat over one set of railroad tracks. The

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25^c
JUNE

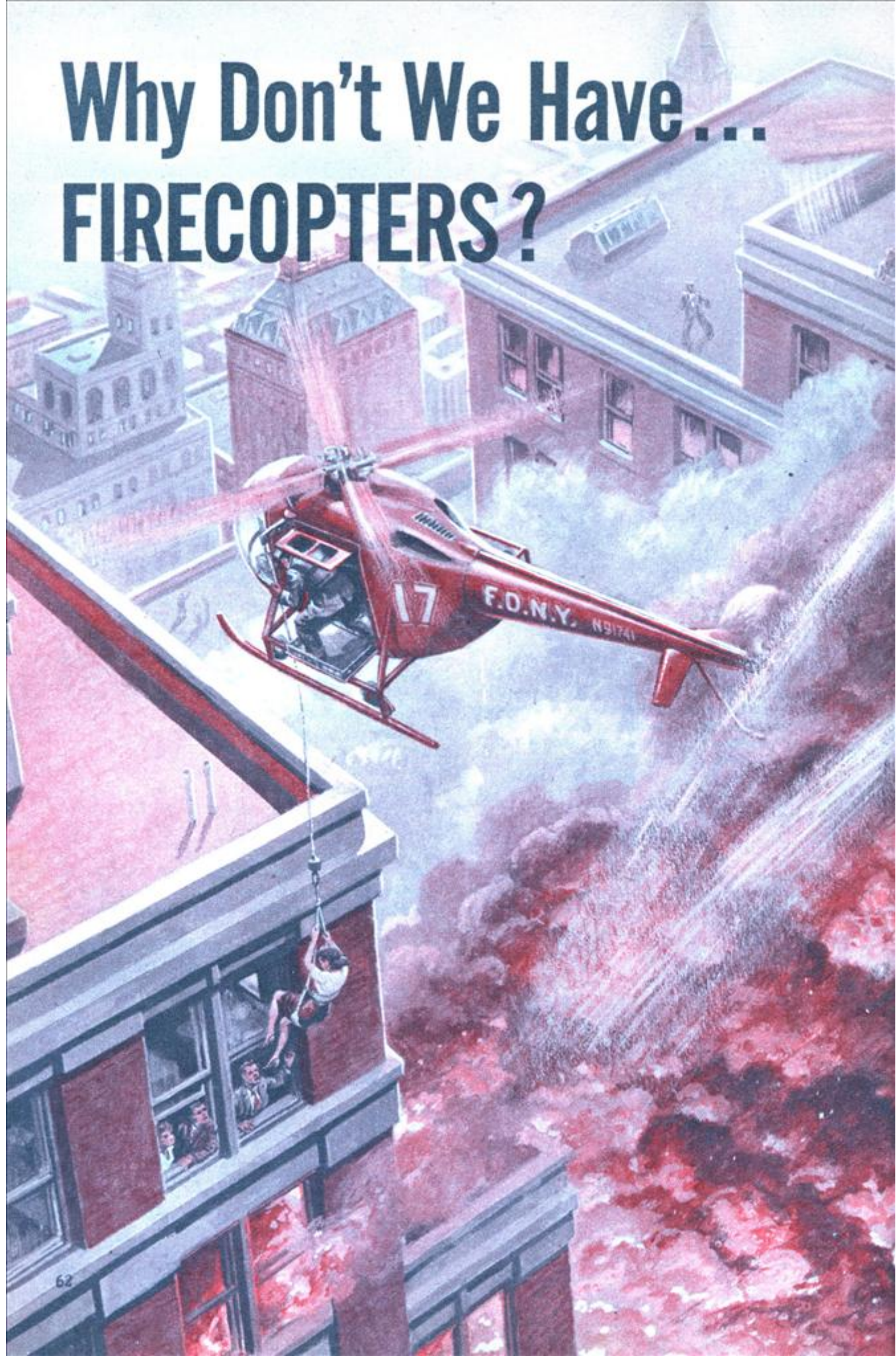
How We Will
**EXPLORE
THE MOON**



FRANK TINSLEY '59

BUILD YOUR OWN LOW-COST SWIMMING POOL

Why Don't We Have... **FIRECOPTERS?**





Helicopter fire engines to fight flames from the air and rescue victims trapped on upper floors.

By Frank Tinsley

REMEMBER the time back in July 1945 when a fog-befuddled Army bomber crashed into the tower of New York's Empire State Building? The plane smashed through the outer wall and disintegrated, dumping a ton of high-test gasoline from its upturned tanks. This torrent sloshed through the wrecked offices and ignited with a roar. Blazing gas poured down the elevator shafts, turning them into chimneys of flame and cutting off escape from the tower floors above. Doors, windows and partitions were blown out by the blast. Plane debris, office furniture and mangled bodies were piled into the corners. Before the smoke subsided, several stories were gutted, 13 people incinerated and 25 others

badly burned! Only chance and luck saved the workers trapped in the tower because rescue was impossible.

The following year on May 20, a C-45 transport plane repeated the performance, plunging into the 58th floor of the Bank of Manhattan Building in the downtown financial district. The ensuing blaze isolated a corner of the towering skyscraper and wiped out five more unsuspecting office workers.

Both these fires posed tough problems for the big town's smoke-eaters. The Empire State holocaust wreaked its destruction some 915 feet above street level, far beyond the reach of the tallest extension ladders and water-tower trucks. The other was equally inaccessible to ground apparatus.

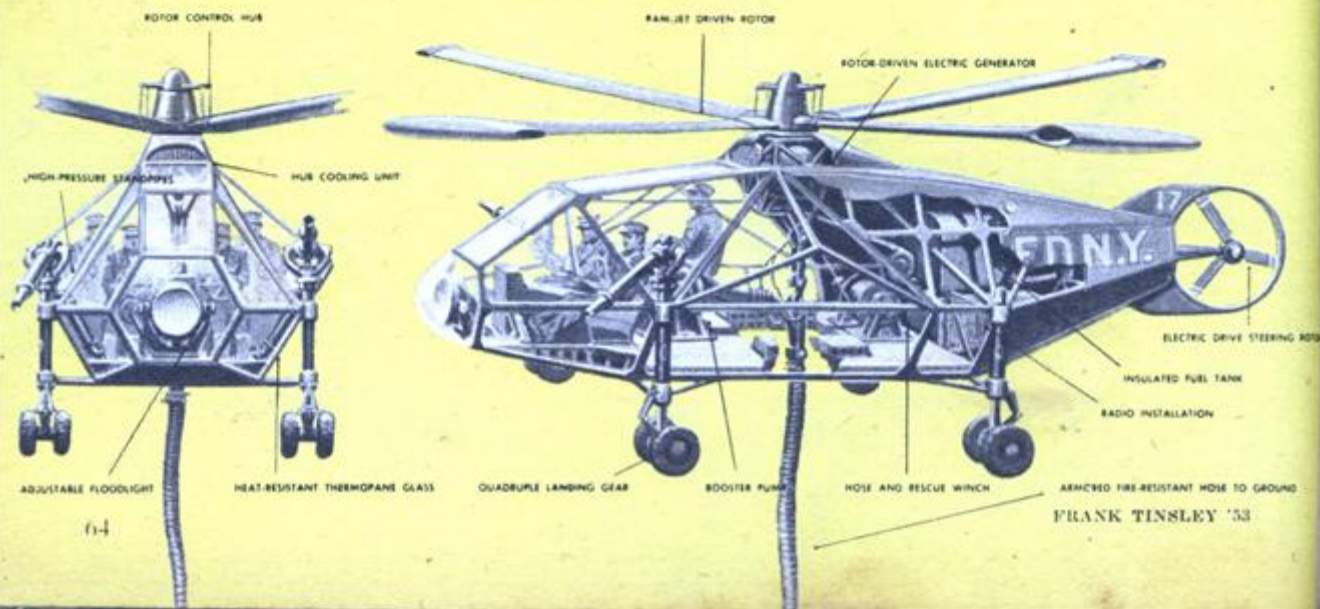
Although all metropolitan buildings above a certain height are protected by built-in hose connections and pumps, the fact remains that it is extremely difficult to fight a blaze from directly above or below in the same building—especially in modern structures with reinforced concrete floors. The only efficient way to fight such a fire is from the outside, at the flame level or just above. In the case of an isolated tower or skyscraper wing, this calls for either a battalion of angels in fire helmets or some sort of skyhook to hold more mundane fire ladders aloft.

The angels are unavailable but the skyhooks, I am happy to report, are definitely in sight. These are in the form of a new type of helicopter dubbed "aerial crane." One of them, in stripped-down, prototype form, is currently being flight-tested by the Hughes Aircraft Company at Culver City, California. It is a huge, queer looking affair, standing almost three stories high on wide, straddled legs like those of a lumber carrier. Designed to lift artillery, tanks and

other heavy items of military equipment across streams and impassable terrain, the finished production models are expected to tip the scales at around 50,000 pounds gross. Driven by jet burners mounted on the tips of the rotor blades, the crane will cruise at 116 mph and have a normal operating range of 200 miles. Up at Palo Alto, Hiller Helicopters has equally large skyhooks on the drawing board and other producers are following suit, for aerial tugboats of this type have great possibilities for civil as well as military use.

Any of these basic, high-lift chassis could be adapted for fire department use. Fitted with small, functionally designed, fire-resistant bodies, they could be readily equipped with electric winches for hoisting hose connections from ground pumpers with booster pumps to step up water pressure and fire-boat type standpipes to direct the streams. Hovering just above the flame level to windward of the rising smoke and gas, they could cope with the most inaccessible blazes. Let's take a look at such an aerial fire engine and see how it might be put together.

Given the necessary lifting ability, the smaller the helicopter, the more room it would have in which to maneuver amid crowded housetops. We therefore give our machine a four-bladed rotor to reduce its overall diameter as far as possible. This also reduces the risk of engine failure as any of the four ramjet engines mounted on the blade tips can turn the rotor at reduced speed. These "stovepipe" ramjets are without moving parts and produce a maximum of power with a minimum of weight and complexity. Their fuel consumption is admittedly high but considering the short runs they will be called upon to make, this is not a controlling [Continued on page 177]



MECHANIX ILLUSTRATED

AUGUST

20¢

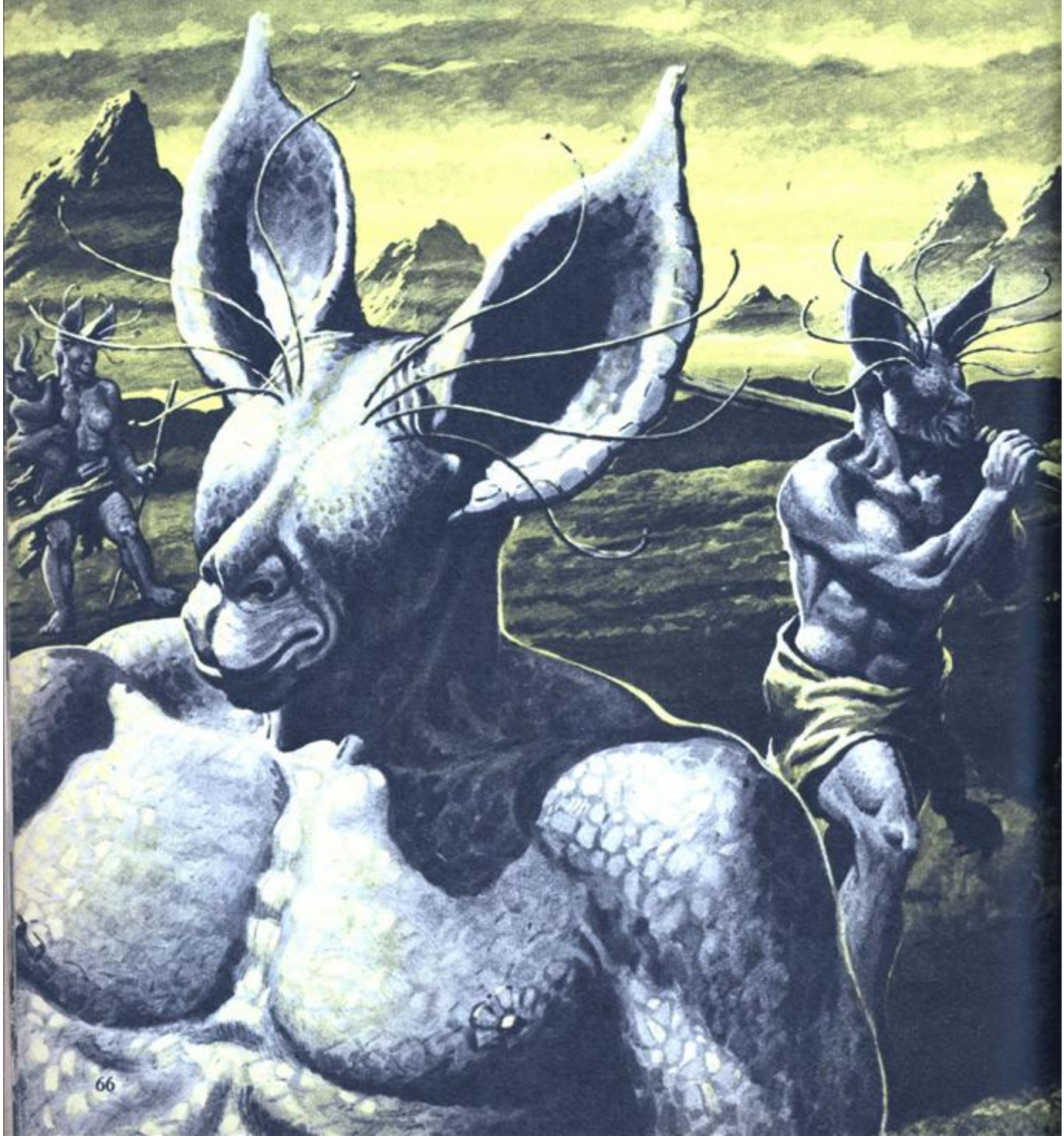
Fighting Fire
From The Air—Page 62

AMAZING NEW USES
OF ATOMIC POWER

SHOOT AND SHOW YOUR OWN
3-DIMENSIONAL MOVIES

How Scientists Visualize

The **REAL** Flying Saucer Men





When scholars of the universe recreate spacemen along logical scientific lines, even those supposed weird little saucerites seem ordinary by comparison.

By I. B. Neer

PRYING eyes of science are probing into space again in the hope of detecting life on other planets.

Armed with new facts, previously accepted theories about what lies beyond the Earth are being discarded by scientists every day and the possibility grows more and more distinct that creatures, more fantastic than our most vivid imaginations could conjure up, may inhabit the planets around us. They



EARTH MAN

Life on other planets probably resembles the human form because it represents two billion years of nature's planning.

VENUS BEAST MAN

Barrel-chested, with a protuberant belly and heavy columnar legs, this sluggish creature is constantly on the prowl for food.

MARS MAN

Slender arms and legs, large chest, flaring nostrils and oversized head give this creature a pixieish appearance.

make those startling stories of weird little men in flying saucers seem tame by comparison.

Dr. Henry Norris Russell of Princeton recently threw a bombshell into scientific circles when he said: "It appears now to be probable that the number of inhabited worlds within the galaxy is considerable. To think of thousands, or even more, now appears far more reasonable than to suppose that our planet alone is the abode of life and reason."

And H. Spencer Jones, Britain's Astronomer Royal and one of the world's most noted inter-planetary authorities, declares: "It is reasonable to suppose that life on any other world will have developed along forms that are entirely different from any with which we are familiar and that are possibly beyond our conception."

Just how would those inhabitants look? Could they be men, beasts, plants or a combination of all three? To get the answer, experts in the field were polled. This question was put to them: "Knowing what we do about conditions on other planets—differences in the constitution of the atmosphere, in the proportion of land and water, the temperatures and other phenomena—what kind of people could conceivably inhabit them?"

Some startling answers resulted. However, all the experts pointed out one vital

fact: on most planets, life as we know it cannot exist. An earthman would die at once on Mercury, his organs ruptured by the boiling of his blood in the tremendous heat of the sun—if he weren't asphyxiated for lack of oxygen and dried up by lack of water. *But the experts all agreed it is entirely possible that other planets may have developed their own life forms, entirely different from ours, suited to the very, very special conditions existing on their worlds!*

Let's go planet-hopping and take a look at a portrait gallery painted by the imaginations of inter-planetary experts.

First to Venus because it is most like the earth in weight and size and, except for the moon, comes closer to us than any other globe. Scientists are convinced that the planet Venus has an atmosphere, but it is composed almost entirely of carbon dioxide, with no detectable free oxygen. No evidence of water vapor has been observed, hence the surface of the planet must be largely desert, with no rivers, lakes or oceans.

What kind of people can live there? John W. Campbell, Jr., a profound student of extra-terrestrial life who is editor of *Astounding Science-Fiction*, a magazine which has successfully prophesied many of the most astounding recent scientific discoveries, says:



JUPITER EYELESS MAN

This squat, hydrogen-breathing man has tremendous muscular development and a built-in solar system instead of eyes.

MERCURY LICHEN EATER

Deep-chested, large-nostriled, four-footed Mercury man follows the shifting sun practically every minute and thus has not developed a culture.

ASTEROID ROCK MAN

Never growing or reproducing, the rock men remain stationary and communicate with one another by mental telepathy.

"Life can exist on Venus without oxygen. Here on earth we have micro-organisms which can stay alive in sulphuric acid and kerosene. Undoubtedly there are life forms which can take the oxygen from carbon dioxide, and why can't these be creatures of flesh?"

Would a Venus man look vaguely like a human? "Why not?" counters Mr. Campbell. "After all, the human form on Earth represents two billion years of experimental engineering on the part of nature. It is the best possible form to do the things it has to. There is every reason to suppose that life on Venus, or on any other planet, if it has developed to a high level, has taken human form. But this form would have to conform to the specific conditions of the planet."

Thus, Mr. Campbell points out, the lungs of a Venus inhabitant would have to be designed to perform a special function of extracting oxygen from carbon dioxide and his body cells would have a different chemical nature than ours. Now, since carbon dioxide is an extremely poor source of oxygen, a Venus man would have to breathe in considerable amounts to extract oxygen, hence his lungs would be developed to enormous size, giving him a tremendous barrel chest.

His food, Mr. Campbell says, would consist of fats and hydrocarbons. Trying to

get life energy from these sources is like trying to burn gasoline under water—it can be done, but you need an awful lot of gas. Therefore, a Venus man would have a grossly protuberant belly and heavy, columnar legs to support his bulk. Because his energy source is poor, his movements would be lumbering and sluggish. And since he must eat such huge quantities, he would literally eat himself out of house and home, living a nomadic life, constantly on the prowl for food.

For this reason, Mr. Campbell thinks that the existence of a high culture on Venus is extremely doubtful since culture develops when people don't have to spend all their time just keeping alive. The Venus man would have no time to think, hence the race would be virtually beast-like.

Now let's leap to Mars and observe a Martian as described by Major James R. Randolph, engineer, mathematician and physicist, who taught at Pratt Institute in Brooklyn, N. Y., and Rhode Island State College and lectures extensively on interplanetary subjects. This is his conception of a Mars inhabitant:

He has slender arms and legs, a large chest, wide, flaring nostrils and a broad mouth. His head would be about a quarter the size of his body; his eyes would be dark-adapted, [Continued on page 97]

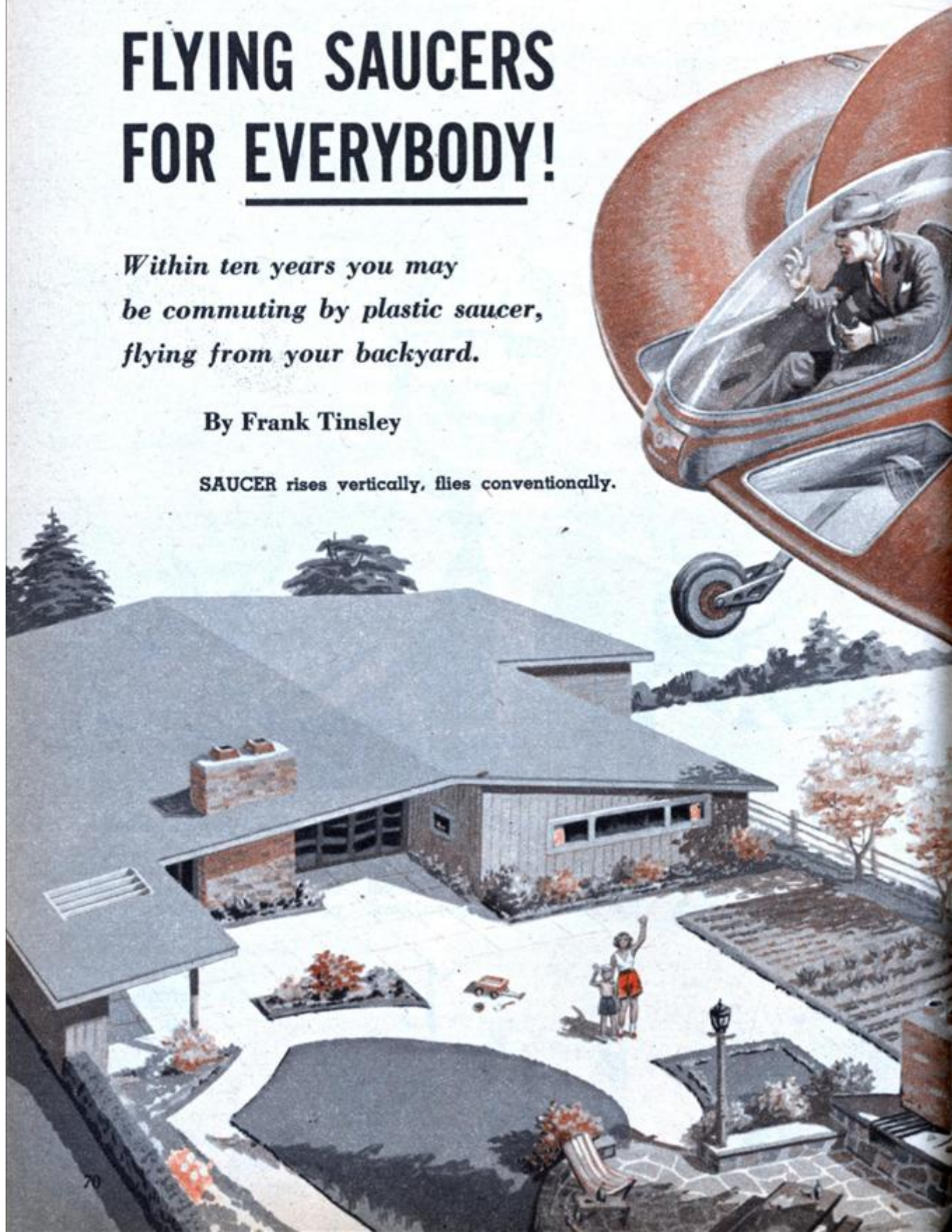
**AMAZING
MARVELS
OF TOMORROW**

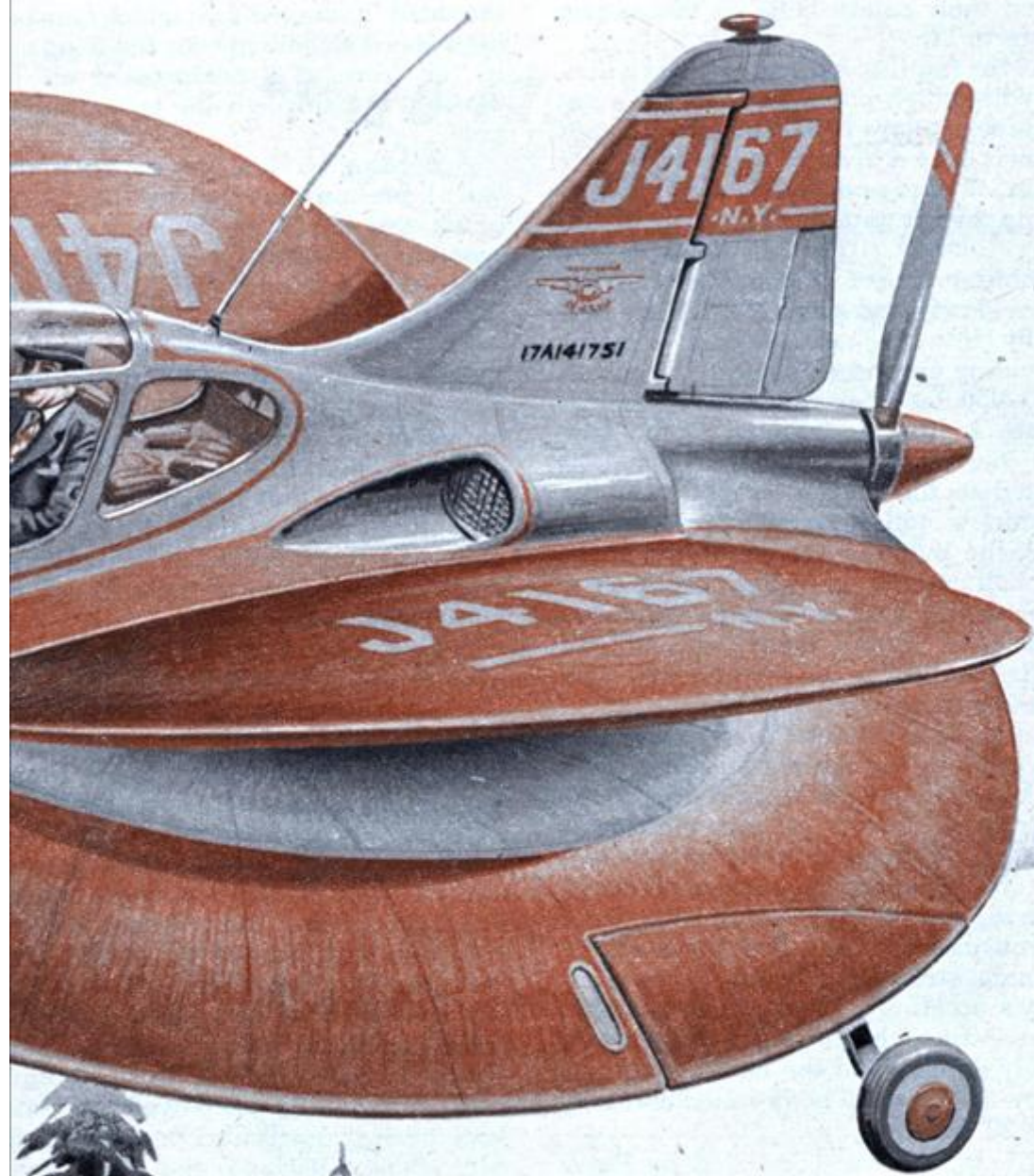
FLYING SAUCERS FOR EVERYBODY!

*Within ten years you may
be commuting by plastic saucer,
flying from your backyard.*

By Frank Tinsley

SAUCER rises vertically, flies conventionally.





IT IS a bright morning in 1965. At precisely eight a. m. Joe Lees emerges from the back door of his lakeside cottage, only 75 miles from his job in the city. In the graveled center of his backyard his jaunty new plastic saucer rests lightly on three tiny balloon tires.

Greeting his neighbor who rides with him, Joe lifts a flush flap in the saucer's rounded nose. He

turns a recessed locking handle and throws back the bubble-like windshield. Spring loaded, like the hoods of today's cars, the enclosure lifts easily. As it does, the interlinked nose cone swings down to form a handy step.

Joe's neighbor steps up over the low instrument pedestal and then across the folded pilot's seat to his perch in the rear. Joe follows, slams the windshield shut and

turns the starter key. The two men fasten their safety belts as the engine comes to life.

As the fan-like inductor begins whirling with a high-pitched whine, the automatic servo-flaps pop open and a torrent of air is drawn inward over the circular wings. Faster and faster it flows, building up the lift pattern of a racing, fixed-wing take-off. For a moment, the trembling saucer remains stationary. Then, slowly and smoothly, it rises vertically into the air like an elevator ascending an unseen shaft.

At 450 feet per minute, the saucer climbs to the southbound traffic lane and the engine's pulsing torque is shifted to the pusher propeller at the machine's tail. As the prop takes hold, the inductor fan gradually slows to a halt and the servo-flaps clamp shut. Functioning now as a fixed-wing airplane, our saucer banks around and heads south at a comfortable 165 mph cruising speed.

As it tools toward the city, other saucers join the parade and there is a thick stream of aerial traffic. Soon, the downtown towers of the metropolis loom on the horizon and a whole complex of distant traffic lanes converge from the four corners of suburbia. Over the business district, Joe turns out of the main stream and heads for the company's building. He throttles back his prop, shifts to the air inductor again and slowly descends to the landing pad. It is now 8:30 a.m. The 75-mile flight took only 30 minutes.

MI's saucer was conceived by Peter Nofi, an officer in the Merchant Marine. Nofi, a dedicated student of aerodynamics, has combined the downward jet thrust of the ducted-fan with the proven principle of the high-lift air-foil. We know that the fan will work because using it, men and machines have been lifted bodily into the air by the modest power of outboard engines.

Nofi's arrangement is inherently simple. He has merely taken the straight airplane wing and pulled the ends around to form a circle with the leading edge facing out. In the center hole of

this doughnut-shaped airfoil, he has mounted a ducted-fan which sucks a high-speed airflow in over the wing and, in the form of a compressed air jet, blows it out through the bottom of the hole.

According to Nofi, the negative (upward) pressure created by the passage of air over the top of the wing, plus the reaction (upward) pressure of the air jet, add up to a total lift ample for vertical flight.

The other unique feature of Nofi's saucer is the pair of semi-circular servo-flaps hinged to the top of the wing root on either side of the fuselage. These open automatically to permit inward airflow when the ducted fan is operating, then close to form the top curve of a large fore-and-aft airfoil when the machine is in forward flight as a fixed-wing airplane.

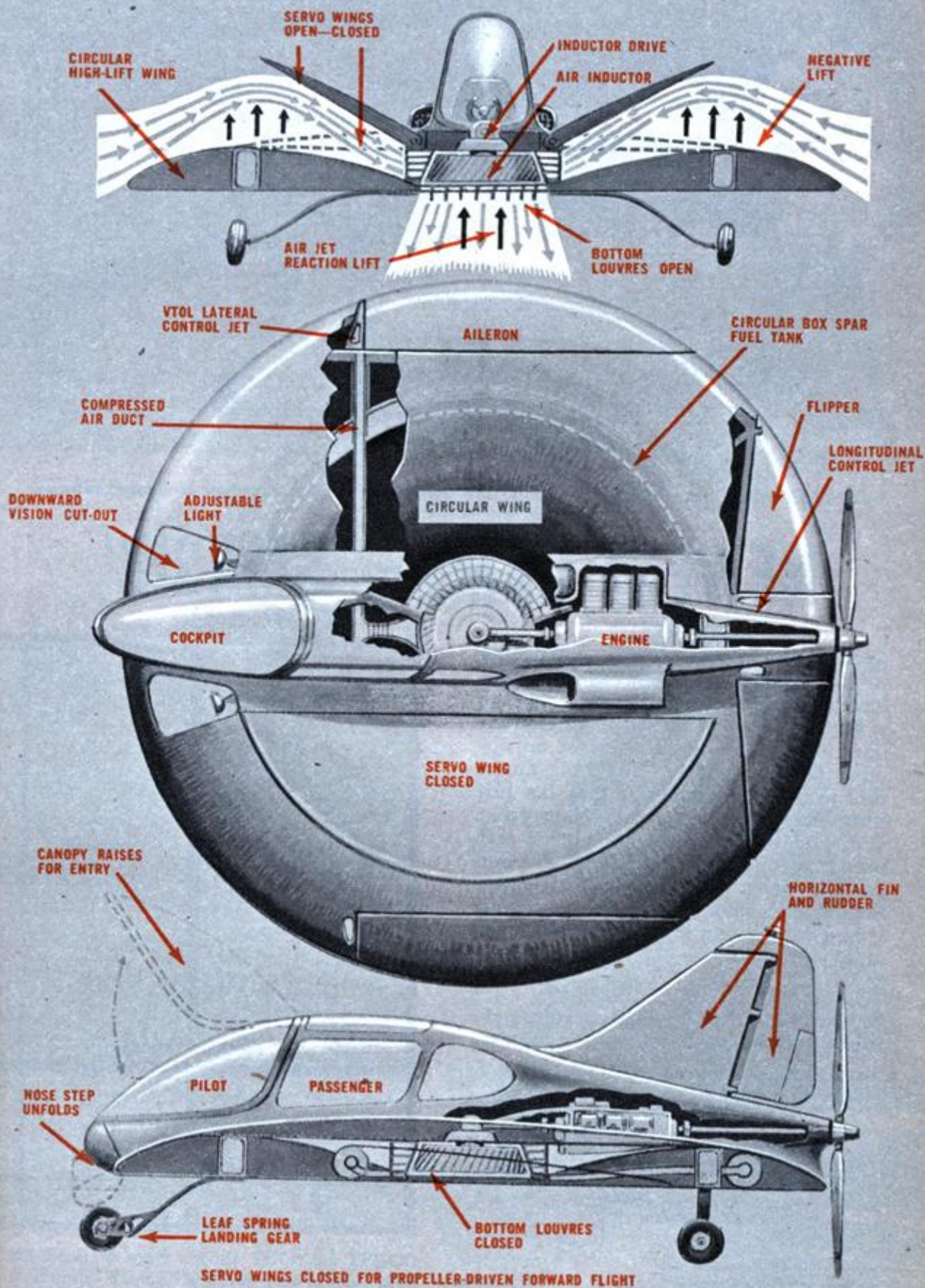
A twin control system is employed to provide for the differing conditions of vertical and forward flight. For vertical take-off and landing, compressed air from the inductor is piped to the aileron and flipper areas and expelled through differentially operated jet nozzles. These are built into the conventional control surfaces used in forward flight and are operated by the same wheel column.

In line with his low cost philosophy, Nofi plans to have the top and bottom surfaces of his saucer stamped out on a press, using a plastic material reinforced by glass "flock." This technique, now successfully employed by small boat builders, will also be used on the servo-flaps, fuselage and other components. Cemented together with the internal gas tank spar, plumbing, etc., in place, the hollow wing will then be filled with a foamed plastic compound which cures into a rigid, air-filled sponge. This replaces expensive interior structure and converts the wing into an unsinkable life-ring for emergency water landings.

Mass produced, the plastic saucer should cost no more than today's medium-priced cars. Could be that by 1965 you'll have one flying out of your backyard, too! •

SIMPLICITY of Peter Nofi's unusual, low-cost saucer is shown in the diagram at right.

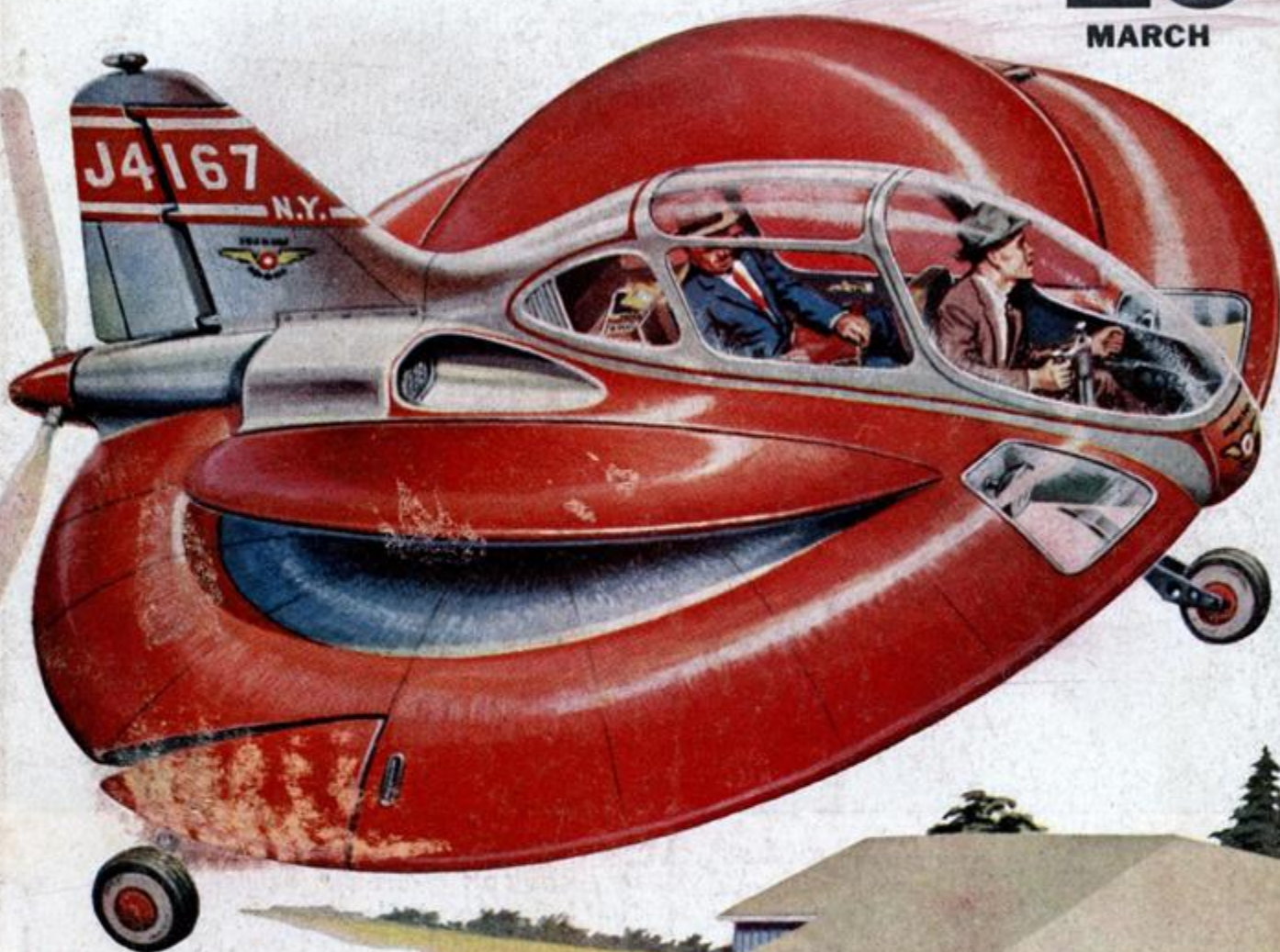
AIRFLOW PATTERN FOR VERTICAL TAKE-OFF AND LANDING



MECHANIX ILLUSTRATED

THE HOW-TO-DO MAGAZINE

25^c
MARCH



FLYING SAUCER

For Private Owners
Makes Any Backyard An Airport
See Page 70

HOW TO TAP A PHONE • BEWARE HOME-REPAIR GYPS

\$10,000 STATION WAGONS • TOM McCAHILL TESTS

Why Don't We Build—

FLYING RAM FIGHTERS!

If atomic attack comes, our best defense may be rammer planes that give the pilot a chance to survive.

By Martin Caidin



The rammer fighter—shown tearing into target—is our last hope for stopping planes that pierce our defense screen.

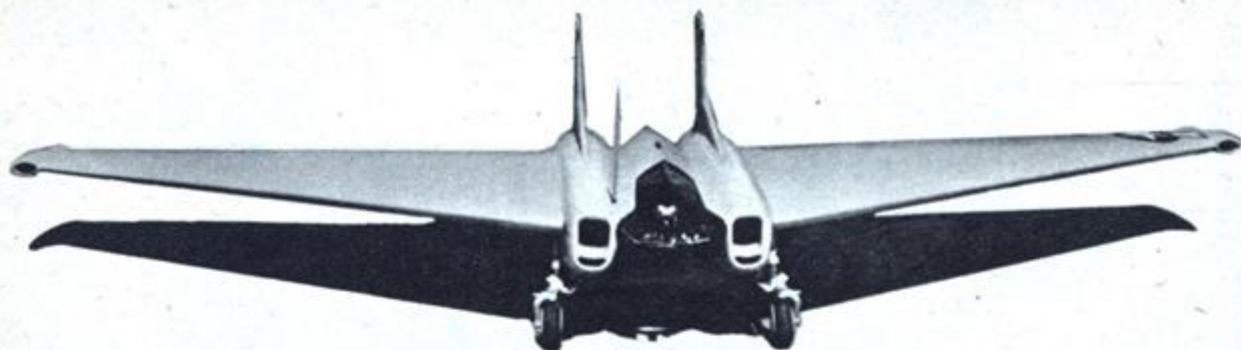


LET'S face it—the complete air defense of the United States is an impossibility.

Even with all-weather jet fighters armed with machine guns, rockets, and guided missiles; with rocket fighters; with unpiloted robot fighters; with supersonic rocket guided missiles; with radar picket ships and picket planes; with ground observers and a far-flung communications system, we can't prevent a certain number of enemy atomic and hydrogen bombs from hitting our cities.

We can, however, reduce the final number of enemy bombers which will break through our defenses. Just eighteen months ago, our nation was so naked to enemy air assault that Senator Stuart Symington warned: "—our capability to stop these bombs runs from a high of 20 percent under ideal conditions, to a low of less than one-tenth of one percent at low altitude or at night."

What has happened in the eighteen months since the Senator uttered his prophetic warning? **MECHANIX ILLUSTRATED** is pleased to report that, while our air defense still has a long way to go before it can provide the protection our cities require, a great many of the enemy bombers which once could hit their targets will never get past America's new aerial defense wall.



Northrop Flying Ram XF-79 was a twin-jet plane with pilot prone in wing.

Since early 1953 your Air Force has added many hundreds of new and deadly jet interceptors to its air weapons system. All-weather interceptors such as the F-94C, F-89D, and the F-86D have electronic "eyes" which can ferret out the location of enemy raiders in darkness or in storm weather. The supersonic North American F-100 and Convair F-102 are in mass production. Our interceptors are fast discarding their obsolescent machine guns and cannon for air-to-air rockets which pack devastating power. Air-to-air guided missiles which "home" on enemy aircraft are fast rolling off production lines.

Nike guided missiles even now are being placed about our critical targets. Boeing's F-99 Bomarc pilotless ramjet interceptor (see MI, August, 1954) is well into its development stage. New radar sites are springing up throughout Alaska and Canada. Long-range radar picket planes of the Air Force and the Navy patrol on 24-hour duty. And the Navy has received hundreds of new trans-sonic fighter planes.

Yet, with all these new, excellent weapons in our air defense system, too

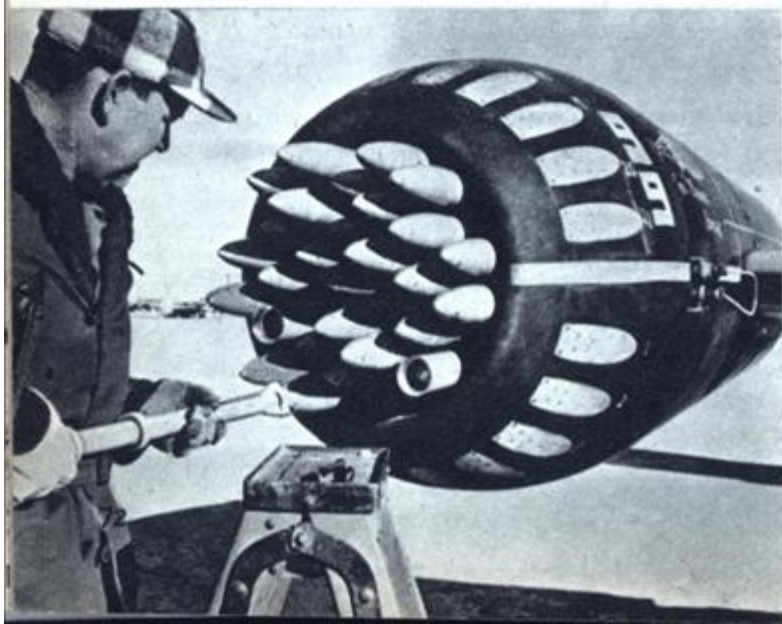
many enemy bombers still can get through to smash at our great factories and at our cities.

The perfect air defense is a pipe-dream; you can't stop all the attacking planes of an enemy force. The idea is to stop so many that you bring the attrition rate of the enemy's forces to forty, fifty, and, perhaps, even seventy percent of his attacking waves. Some bombs will get through, certainly, but the attrition rate can be made so costly that we can destroy the enemy's ability to sustain attacks against us.

Our new air defense weapons are geared to more and more electronic complexity. The pilot is fast becoming a human servant of the myriad mechanical and electronic devices in his interceptor. In many respects the pilot has been altogether eliminated!

In today's air war, electronics are a vital necessity. For electronics tie in together the many parts of the overall weapons defense system. A far-flung radar system, for example, is useless unless it has rockets and guns to back it up. And thousands of top-notch interceptors are useless unless

First photo of rockets being loaded into one of twin rocket pods of Air Force's Northrop Scorpion F-89D. Each pod carries 52 rockets.



Lt. Comdr. Harry Peck dons Navy's first full pressure flying suit, developed by Goodrich. Suit protects pilots flying above 50,000 ft.



they can be directed accurately to their targets.

A weapons system based on electronics, however, also is peculiarly vulnerable to what is known as jamming. It's no secret that there exists today a method for rendering ineffective through jamming techniques our early-warning radar. Jamming means that the enemy, at the crucial time, can render our electronic eyes blind.

Remember the famed "windowfoil" of World War II? To foul up German radar-directed heavy anti-aircraft guns, our bombers released thousands of tiny metal strips while pounding their targets. The twisting, fluttering strips reflected on the German radarscopes, completely neutralizing the heavy guns' radar-direction system. That's one example of jamming.

The more complex your defensive electronics system, the greater the danger of effective enemy jamming. The idea is not to become so completely dependent upon electronics that successful jamming will render our planes and guns "blind."

Recently an old concept of aerial defense has been dusted off for possible reintroduction into our air defense system. For a while after World War II we were so dazzled by the idea of radar and electronically-controlled flight that everybody assumed that the pilot—the human factor—was on the way out. In a matter of years, cried the experts, all our planes would be fully automatic and the pilot would be as dead as the dodo.

But is this true? Let's take a hypothetical air defense situation and see. We'll assume that an enemy force of twenty bombers is trying to hit New York, Wash-

ington, and Philadelphia in a high-speed, high-altitude attack. Early-warning radar pinpoints the enemy bombers, and our planes successfully intercept the attackers.

The air battle is swift and sure. From a position beyond the range of enemy guns, each fighter launches four air-to-air missiles which "home" on the enemy planes. Not all the missiles hit their targets; enemy jamming impairs the aim of several. Then the fighters close in, launching swarms of powerful 2.75 inch rockets. In a few minutes all ammunition is expended, and sixteen bombers are destroyed.

Sixteen out of twenty! Why, that's terrific! And we lost only three fighters. It's wonderful news, a smashing victory.

Wait a moment—what about the remaining four bombers? They are closing in on their targets, and each plane carries either an atomic or a hydrogen bomb. One hydrogen bomb may kill over a million people and lay waste the heart of a great city.

What can the fighters do—now? They've expended their rockets and their missiles. But those bombers are still up there, getting closer every minute to the millions of helpless people on the ground.

There is only one thing to do. Ram!

Deliberate ramming may be the most effective means of achieving the highest kill ratio of enemy bombers. One single fighter already miles high in the cold, sparse air of the sub-stratosphere is worth a hundred planes on the ground. Why should the effectiveness of this one plane, once it has expended its ammunition, be altogether lost? [Continued on page 217]

Doomed B-29 plummets earthward over Kyushu, Japan, after being rammed by a Jap fighter. Defense against rammers is almost impossible.



USAF Captain Edward Sperry plays guinea pig in testing automatic pilot ejection from plane hatch. Pilot's parachute opens automatically.



Let's Use Helicopter Cavalry



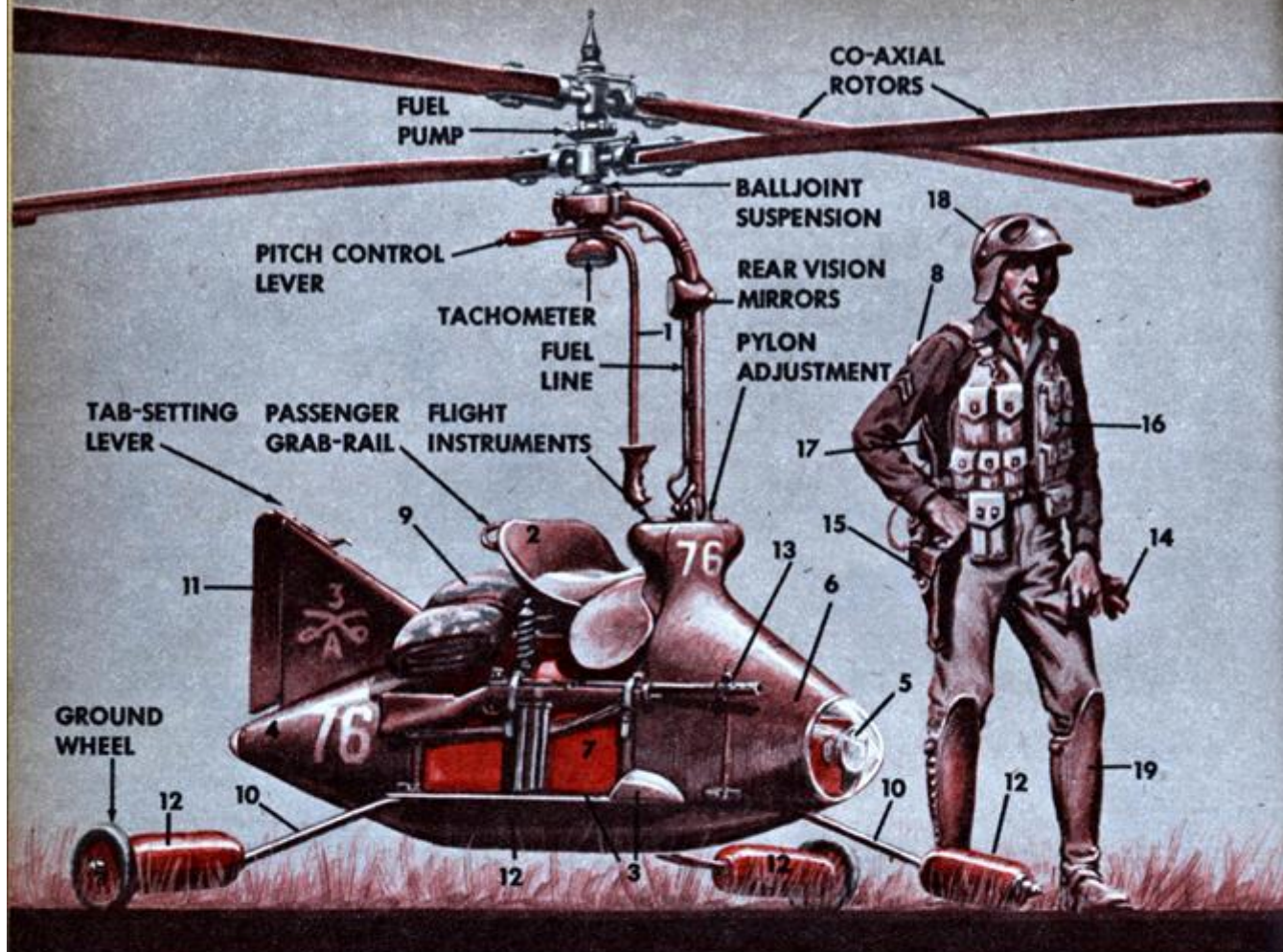


*Swooping in suddenly, helitroopers on powerful
“sky horses” could wreak havoc with enemy troops.*

By Frank Tinsley

SCATTERED along the western slope of the Asiatic coastal range, the copter troopers and their mounts cluster in little groups as the rising sun climbs behind them. The jump-off moment is fast approaching. Within minutes, the sun will burst blindingly above them to cover their westward assault.

The first elements of the blitz landing—submarine-borne marines—had hit the enemy coast only three days ago, seized the controlling crests and passes of the coastal hills in bloody fighting, well covered by massive flights of water-borne jet fighters.



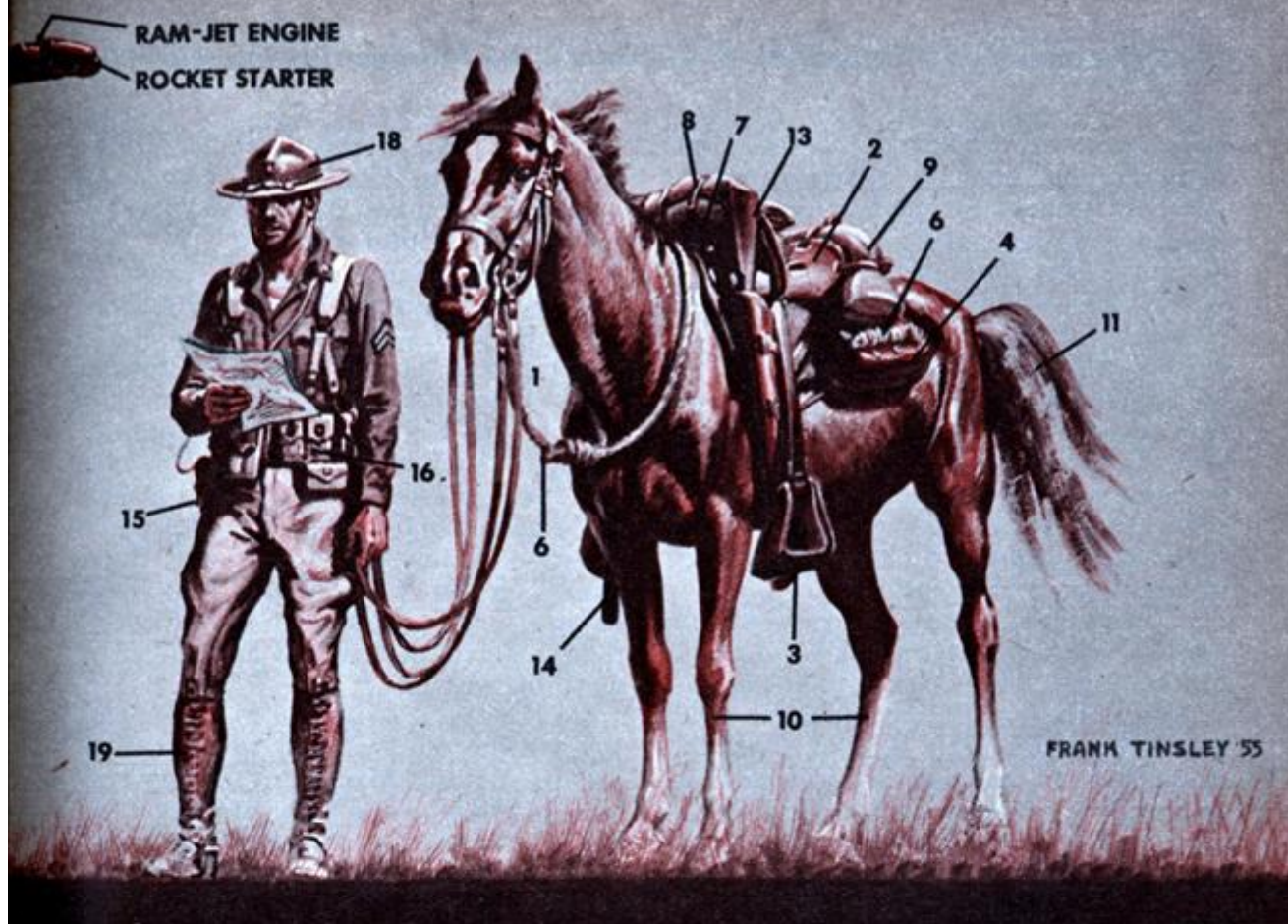
A comparison of equipment carried by the helicopter trooper and the horse cavalryman.

HELITROOPER

1. Control stick.
2. Motorcycle/stock saddle combination.
3. Runningboard and toe-caps.
4. Tilting tail cone: ammo, rations, etc.
5. Tilting nose cone: landing lights.
6. Tie-down ropes, tent pins in nose cone.
7. Fuel tank.
8. Slicker on combat pack.
9. Cantle roll: camouflaged copter cover.
10. Three spring landing legs.
11. Directional tail fin and trim tab.
12. Leg floats for water.
13. T-47 auto rifle.
14. Combination sword/tool on belt.
15. Pistol in belt holster.
16. Ammo pockets/armored breastplate.
17. Combat pack on armored backplate.
18. Visored helmet with goggles.
19. Zippered, armored jackboots.

HORSE TROOPER

1. Bridle and reins.
2. McClellan saddle.
3. Hooded stirrups.
4. Saddle bags: ammo rations, etc.
5. (No equivalent).
6. Halter shank, lariat, picket pin.
7. Pommel roll (feedbag).
8. Slicker above feedbag.
9. Cantle roll: tent, blankets, etc.
10. Legs.
11. Tail.
12. Horse can swim stream, tow rider.
13. '03 rifle in leather boot.
14. Sabre, right side pommel.
15. Pistol in belt holster.
16. Ammo belt and suspenders.
17. (No equivalent).
18. Campaign hat.
19. High laced boots and spurs.



On the second day, the supporting units of army troops arrived. They came in widely dispersed waves of huge, A-powered flying-boats that landed beyond the breakers and nosed ashore to land men, machines and supplies. This was an almost undetectable operation, stretching along a hundred miles or more of shoreline like a thin but strong garrotting cord. Nowhere was there a great enough concentration to draw an enemy A-bomb.

Toward the center of the invasion sector, a narrow valley traversed the mountainous country in a westerly direction, forming a winding corridor toward the industrial and agricultural heart of the area. Late yesterday afternoon, newly landed tank columns started up the valley and bogged down immediately under hilltop artillery fire.

But a new element has entered the picture since the Italian campaign of World War II. The old horse cavalry has been reactivated recently and is now available, mounted on swift, one-man

helicopters. The well-dispersed brigade has been in constant radio-telephone communication and as the zero hour draws near, commands begin to crackle along the mountainsides. "Check your revs. . . Prepare for take-off!" Starting rockets twinkle in tight circles as the blast of hundreds of tiny ramjets settles into a sustained roar.

Like a swarm of wasps, the troops assemble in midair, fall into the prescribed formation and high-ball for their objectives. Skimming over hill-tops, through gaps and along narrow gorges, the agile copters take advantage of every possible cover. Although the flying is dangerous, ground-hugging keeps them below the zone of radar detection and enables them to burst upon ground positions in full force.

Like Indians galloping around a beleaguered wagon train, the cavalrymen circle their hilltop prey. In moments, the battery is a hell of pinging bullets, bursting grenades and flaming napalm. As soon as the position is secured, re-

Invasion Base on the Moon

"The first nation to establish a lunar military outpost will rule the earth," says Willy Ley, expert in rocket research.





INVASION ROCKETS

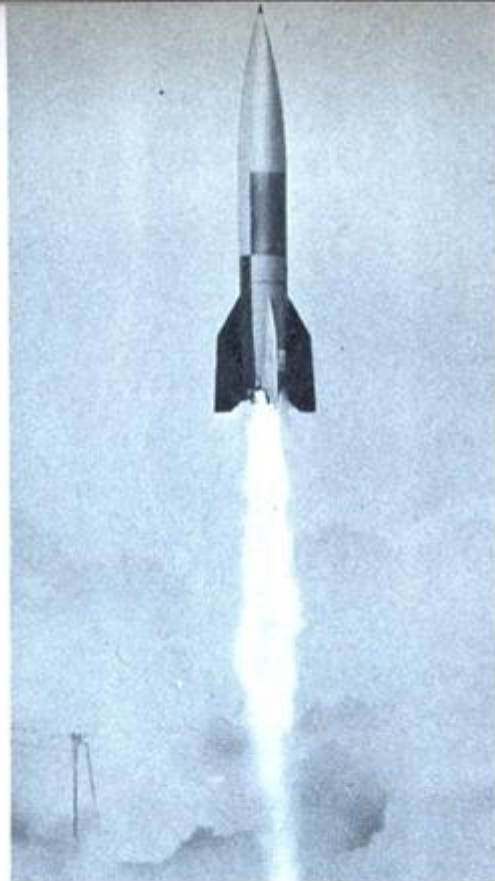
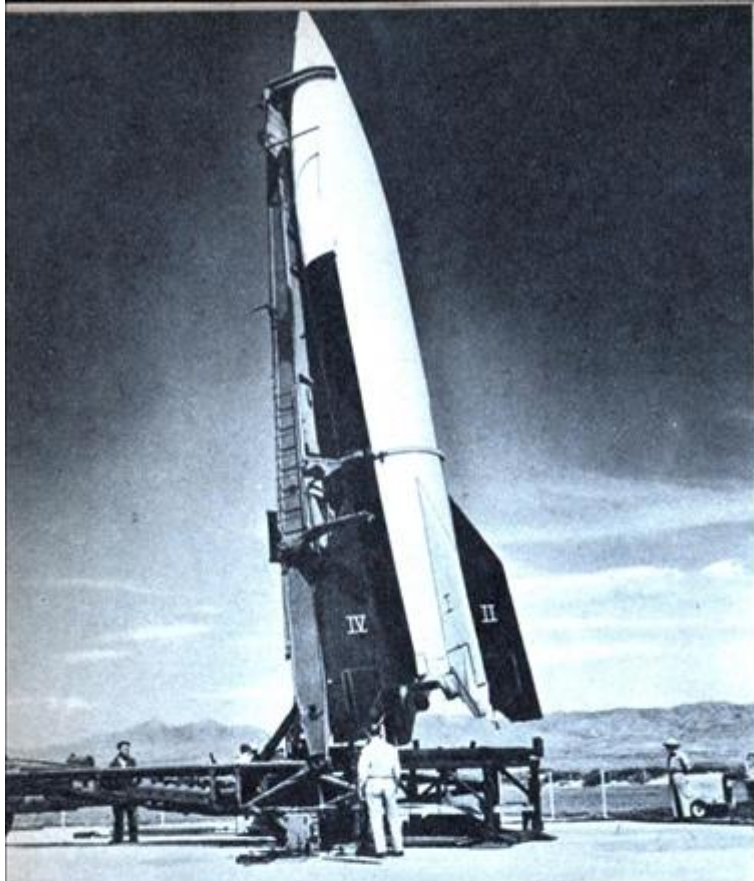
EARTH

The moon base could be built in a large crater, a mile or so wide, containing concentric rings of launching platforms. A spoke-like network of roads would join these to the main control dome in the center. An alternate control post, at left, could be hidden in the crater's rim. Rockets shown are similar to Nazi A-9.

MAIN CONTROL STATION

THE man in the moon may plot the attack that will open World War III. For the man in the moon will be a powerful "spy in the sky" rocketed to the earth's satellite by the aggressor nation to prepare the way for an all-out assault to conquer the world.

Soon after a 20th-century Columbus pilots his rocket to the moon, the nation that sent him there will have a lunar base that will expose any spot on earth to celestial spying and sudden rocket invasion.



The 46-ft., 14-ton German V-2, shown above on its launching platform and in flight, penetrated the stratosphere far above the earth's surface. In a few years, the author states, a pioneer will reach the moon.

The moon's terrain, scarred with countless craters, has thousands of excellent sites for offensive bases. The aggressor who sets up the first interplanetary outpost on the moon can dominate not only the world but the entire solar system.

As the moon-bound rocket zooms out of the world, the space explorer will see that the earth has become a great display window for him. In a single historic flight he will have eliminated from the vocabulary of the world's nations the term "military security."

From the barren lunar wasteland or towering volcano to which he anchors his rocket he will focus high-powered telescopic lenses on the earth. These lenses will be 5 times more powerful on the moon than on earth, since the moon has no atmosphere to limit magnification. Thus, he will be able to observe, at one time, great factories operating in Los Angeles, Chicago and New York. As the earth rotates on its axis, he will see similar activity in London, in Moscow and in Tokyo. The new man in the moon will be able to watch as each nation works on its railroads, ports or factories—or stockpiles of atom bombs for war.

The pioneers who plan to build a base on the moon won't find their task too

tough, even on the basis of what we know today about conditions there.

Like the earth, the moon has a day and night. One complete night-and-day cycle on the moon, however, lasts a month. Fourteen earth days of cold night anywhere on the moon follow a similar period of intense heat when that same part of the moon's surface is exposed to the sun. During a "moon day," the great satellite's surface is heated to a temperature of 392 degrees. "Moon nights" will approach absolute zero in coldness.

As a result of these extremes of temperature, the moon pioneers will find its surface covered with rock debris, chips and dust, since no rock can stand such sudden heat changes without cracking. And since there is no air on the moon, the moon men will find no surface water.

The base builders, then, will face a double problem of maintaining an even temperature and providing themselves with air and water.

By going underground they will solve the temperature problem, since the extremes of temperature occasioned by the month-long lunar cycle are strictly surface phenomena. The first expedition to the moon will look for a large, deep cave, because the temperature below the surface debris, [Continued on page 162]

A well-known aircraft company, which desires to remain anonymous, is working on this man-carrying rocket depicted by an MI artist. Wings control it in air.



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Invasion Base on the Moon

[Continued from page 62]

although probably cold, will be even. If the moon men find no natural cave, they can make an artificial one by tunneling about 500 feet into a mountain.

Before the earthmen can solve any problems on the moon, however, they will have to set up an atomic pile; this will be the key to their permanency on the moon. The atomic pile will produce the heat, and this, in turn, will produce the steam which will run any construction equipment needed. And eventually the pile will produce the air and the water by which the moon pioneers will live.

While the moon men build their atomic engines, they will live on the rocket ship that brought them to the moon, and use a supply of air and water from the earth. Space suits, with airtight joints. Plexiglas head bubbles and built-in heating units will enable them to work away from their ship on the lunar terrain.

The cave shelter will be sealed off by an airlock, a set of two airtight doors with a space between them. In this way, only the air in the space between the two doors will be lost each time someone enters or leaves.

Additional fresh air will be made right on the moon. Since oxygen atoms are locked in most rock compounds, decomposing the rock will liberate breathable oxygen. Hydrogen—needed to combine with oxygen to form water—also is hidden in many minerals. These elements can be liberated from their rocky prisons by energy from the atomic pile, which produces this energy continuously by transforming heavy atoms into lighter atoms. With this unlimited atomic energy, many of the necessities of life can be extracted from the rocks forming the mountains of the moon.

With the cave supplied with air and water, the moon men will draw further on their atomic pile for heat and light, by steam and steam turbine, and electric generator.

The lamps which light the cave will be Vitamin-D-producing sun lamps capable of supporting plant life. Since the crushed rock of the moon's surface will be useless as soil, hydroponic gardens will produce tomatoes, cucumbers, lettuce and other vegetables. The breath of the men in the cave will supply the carbon dioxide necessary for these plants. The plants, in turn, will give off oxygen.

A moon crater will make a natural base for invasion rockets. The high, circular rim of the crater will act as a bunker against external bomb blasts, and the upthrust of the lava rock in the center will provide an elevated platform for a control dome.

Almost impossible to spot among the maze of surrounding pits, the crater is easy to guard against ground invasion and can be destroyed

[Continued on page 164]

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4881

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Old-Time Railroad

[Continued from page 70]

the model was assembled, water in the boiler and a head of steam from alcohol fuel in the firebox are all that are needed to operate this Lilliputian "Mogul" under its own power.

All over the Kimball Ranch—in the spacious, modern home, in shelves along walls, in the artist's studio, in the yard, in outbuildings and other storage spaces there's an almost bewildering collection of antique railroad equipment. Much of it few modern train travelers would even be able to identify. There are old locomotive headlights that burned kerosene or Pintsch gas, old bells, whistles, coach and station lamps, pot-bellied cast-iron stoves, and white-washed coal burners that once heated trains and depot waiting rooms. There's a museum of telegraph equipment, conductors' lanterns, wash basins from ancient Pullman cars, public drinking cups and roller towels.

The Kimball Library of Railroading contains more than 1,000 books, volumes covering every imaginable subject from 1835 until the present. It also has a vast collection of old railroad time tables, advertising lithographs, travel guides, railroad songs, tickets, passes, and other printed matter—much of it from railroads that have rusted into history. A tremendously fascinating section of the library is an assortment of railroad patents, patent drawings, lithography and working patent models.

Whether or not you are a model-railroader, if you should happen to be driving through picturesque San Gabriel Valley in the future, be sure to stop by and observe the Grizzly Flats. You'll see for yourself a railroader who is literally "riding his hobby." •

Invasion Base on the Moon

[Continued from page 162]

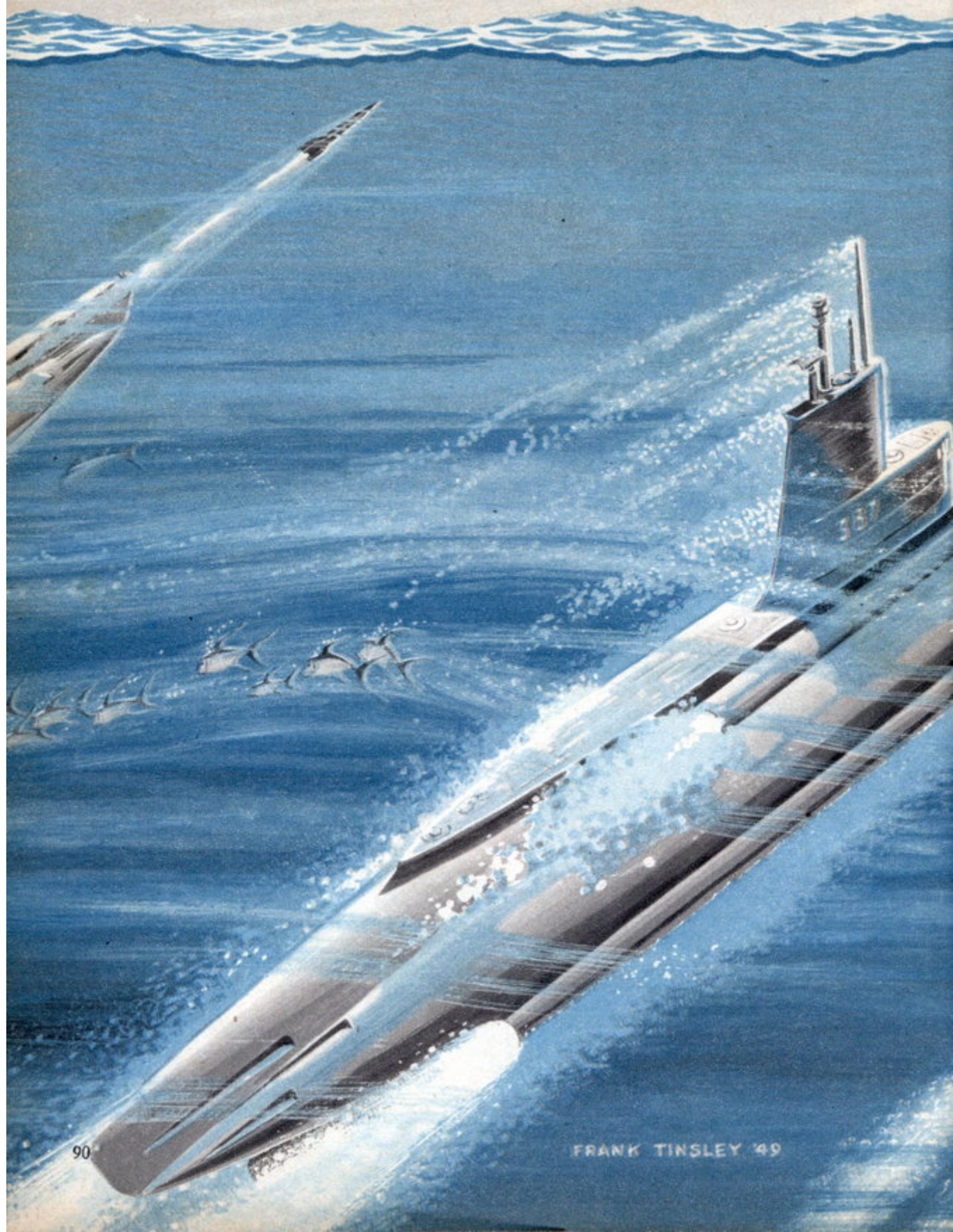
only by a direct atom-bomb hit—a practically impossible feat from our atmosphere-blinded earth.

The rocket-base construction will be comparatively simple. It will only be necessary to build a ring of concrete launching pits and connecting service roads, easily laid on the level pumice that fills the crater.

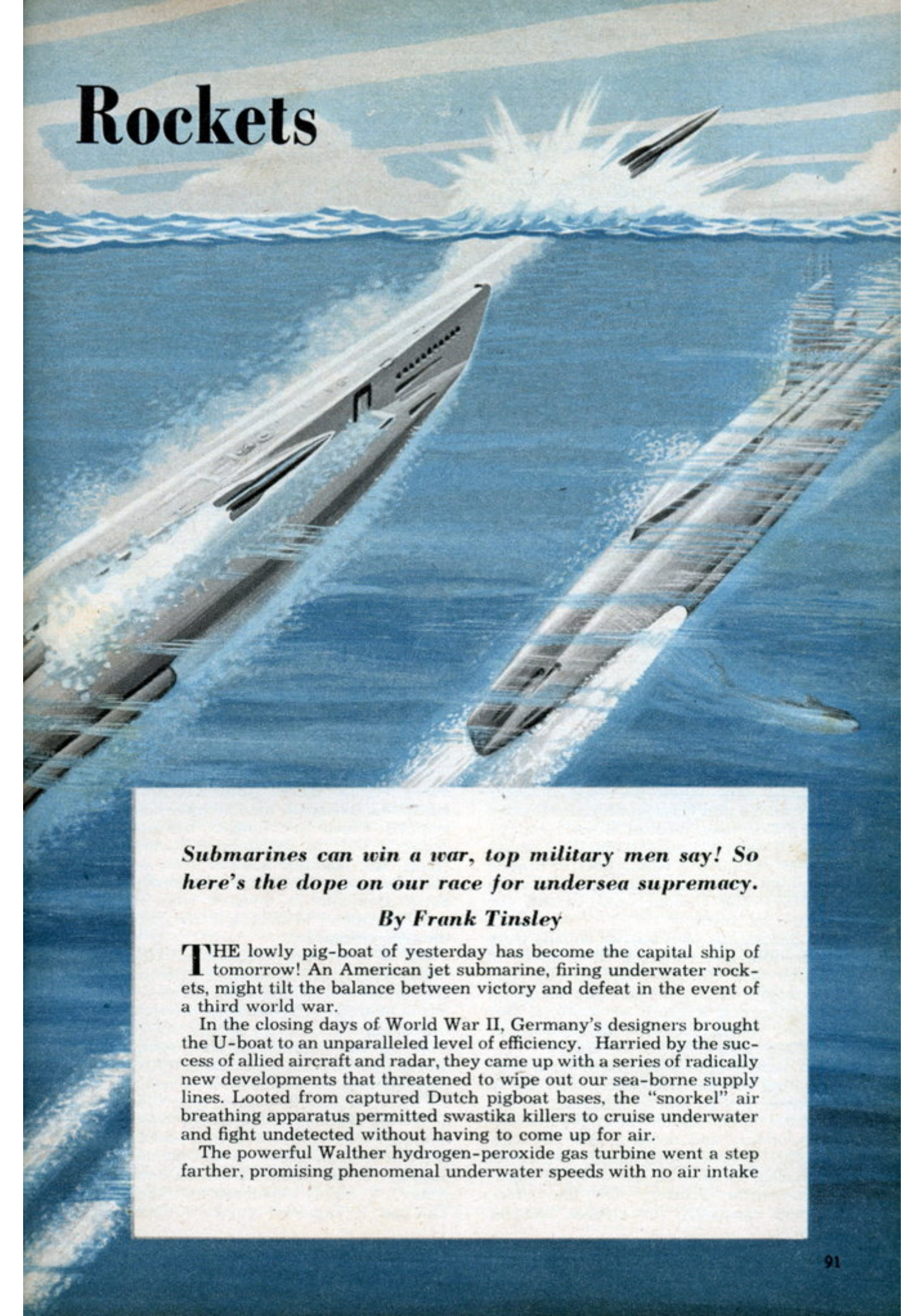
Thus, an atomic pile and a few simple elements are all that will be required for an invasion base on the moon, once the interplanetary explorer "stakes" the earth's satellite for his country. When this happens, the moon may lose its "June-spoon" romance.

Then it will set the scene for world-shattering war, unless earthmen meanwhile find peaceful means of settling their disputes. •

Jet Sub Fires Underwater



Rockets



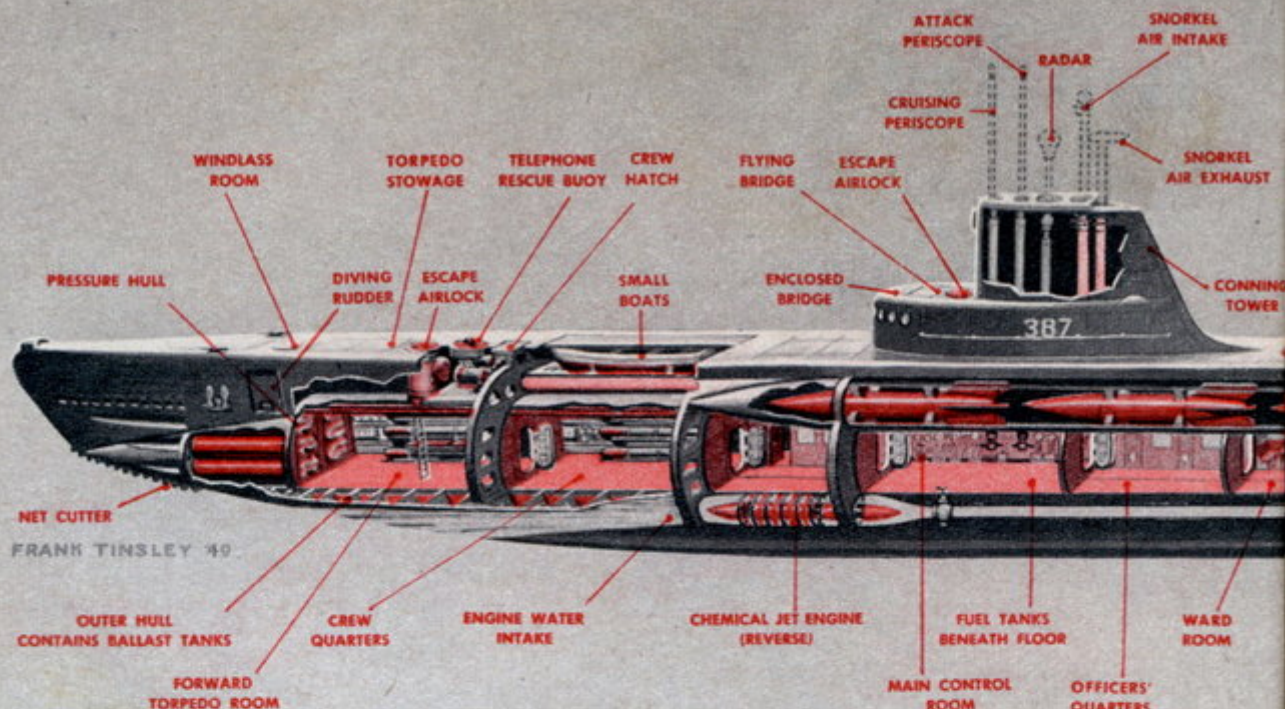
Submarines can win a war, top military men say! So here's the dope on our race for undersea supremacy.

By Frank Tinsley

THE lowly pig-boat of yesterday has become the capital ship of tomorrow! An American jet submarine, firing underwater rockets, might tilt the balance between victory and defeat in the event of a third world war.

In the closing days of World War II, Germany's designers brought the U-boat to an unparalleled level of efficiency. Harried by the success of allied aircraft and radar, they came up with a series of radically new developments that threatened to wipe out our sea-borne supply lines. Looted from captured Dutch pigboat bases, the "snorkel" air breathing apparatus permitted swastika killers to cruise underwater and fight undetected without having to come up for air.

The powerful Walther hydrogen-peroxide gas turbine went a step farther, promising phenomenal underwater speeds with no air intake



required at all! V-2 missiles were being readied by the Germans for sub-surface launching in a campaign to bombard New York and other key coastal cities.

Right now, obscured by the hubbub of atomic bomb publicity, a quiet but deadly race for underwater military supremacy is being run by Russian and American scientists. For when the Nazi machine finally folded and Russian divisions flooded eastern Germany, most of Hitler's experimental U-boat stations fell into their hands. The loot included a whole fleet of brand-new, high-speed snorkel subs and most important—the U-boat built to test the Walther gas turbine!

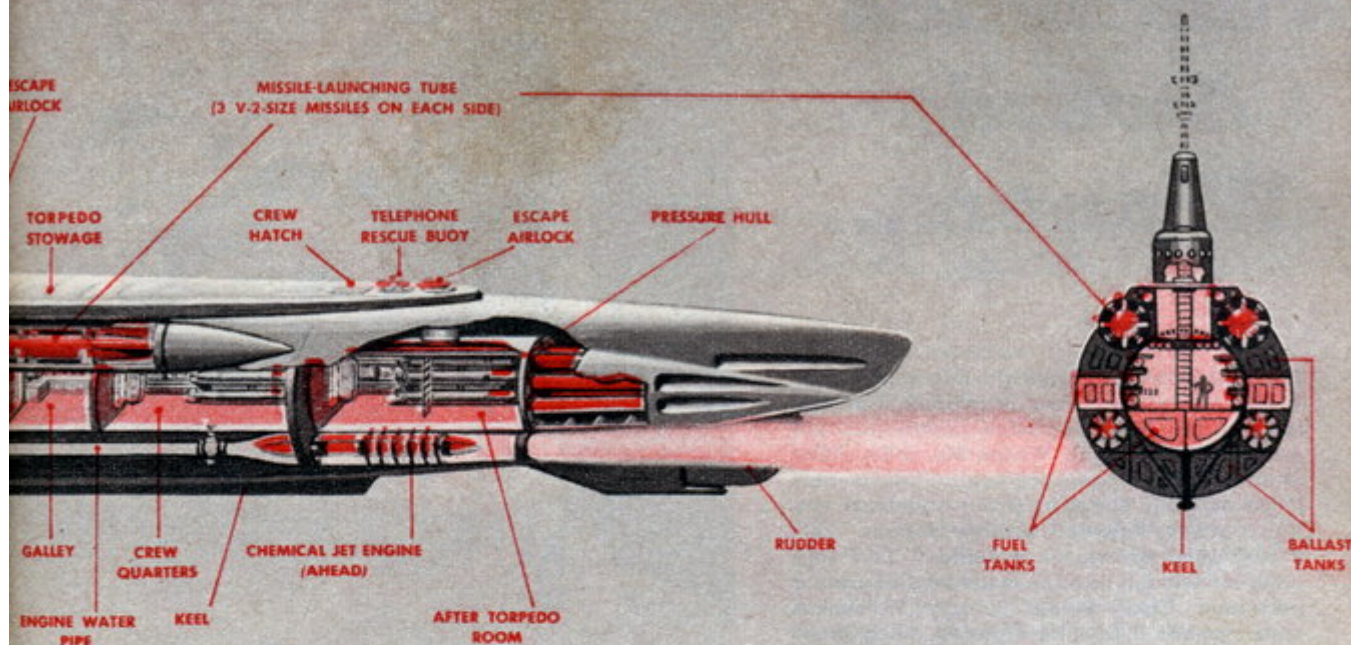
Of course, our own science squads were on the job, too, collaring their share of research data. Our navy had already captured copies of the snorkel and today we are converting a score or more of our big fleet submarines into up-to-date air breathing models called the Guppy.

Our navy's best brains have been concentrating on the problems of advanced submarine design and anti-submarine devices and tactics. In our internal battle between offense and defence, first one side and then the other pulls ahead. To counter the snorkel's improved speed, we're building fast surface cruisers—7000 ton killers, designed especially for U-boat fighting.

The sub-offense boys retort by coating their periscopes and snorkel tubes with antiradar "paint," a substance which reduces the reflection of radar waves. Then our electronics experts come up with more delicate radar sets which pick up tinier targets at greater ranges.

Gas turbines cut down an undersea boat's engine noise. However, new and more sensitive sonar devices have been developed which are housed beneath the cruiser's hull in streamlined domes and "ping" the slightest sounds. And to help out even more, the "MAD" (Magnetic Airborne Detector) is lowered from blimps and helicopters to help spot the subs. So, the race zigzags on.

One of the newest and most startling developments is the simplified, chemical jet engine devised by Dr. Fritz Zwicky, California Institute of Technology physicist and rocket expert. It works on the same principle as the ramjet. As the submarine moves forward, sea water rams into an intake opening at the bow. It is conducted aft to the engine through a long tube and a wetting agent is added on the way. This amplifies the chemical reaction which takes place a moment later in the combustion chamber of the engine, breaking down the water into highly expansive hydrogen gas. This gas is expelled rearward through a



standard jet nozzle, thus driving the vessel forward.

The exact fuel to be used is still a deep secret and Naval Intelligence has clamped a tight gag on the Aerojet Engineering Corporation, where the model is being developed. Any competent chemist, however, can name a string of propellents that react when brought into contact with water. The list includes metallic potassium, sodium, white phosphorus and various metallic hydrides, some of which can be carried in regular submarine fuel tanks in liquid form. A power plant of this type is almost ideal for torpedoes and, in a slightly revised form, for airless submarine propulsion.

Adding these features together, we can get a pretty good picture of the future undersea warship. The atomic power plant would be the final answer to the submariner's prayer but unfortunately it's still several years off.

On these pages, we've planned a sub, confining ourselves to what actually *can* be built *tomorrow*. That means a chemical engine, either of the German Walther or Caltech Zwicky type, with the latter preferred. For practical operation, the simple, forward-propelling ramjet is not enough. Our future sub must be highly maneuverable so a second set of ramjets is necessary. Also, our ship requires plenty

of electric power to operate its various devices. This should be generated as a by-product of the main engines. Consequently, we must add a turbine-driven generator to each engine and step up its capacity. Also a generous bank of high efficiency storage batteries.

Thus we find ourselves with a double-ended twin power plant. Just inside the water inlet on each side of the bow is a Zwicky reaction turbine which ejects its jet forward to reverse the submarine. A long water pipe connects this with a similar rear-facing engine which supplies the vessel's forward power. Either turbine can be reversed and driven electrically to act as a booster water pump for the other unit. The chemical fuel is carried in ship length tanks set between the power plants and inside the pressure hull. If necessary, auxiliary tanks may be situated in the outer hull spaces not needed for buoyancy.

The elimination of the big diesel and electric engine rooms shortens the vessel to a little over 200 feet—about a third shorter than our current fleet submarines. This will make it more maneuverable and save on fuel.

For anti-sub action, she's armed with six torpedo tubes at each end, and equipped with all the latest detection and fire control apparatus. [Continued on page 148]

AMAZING
MARVELS
OF TOMORROW

MAIL VIA ROCKET

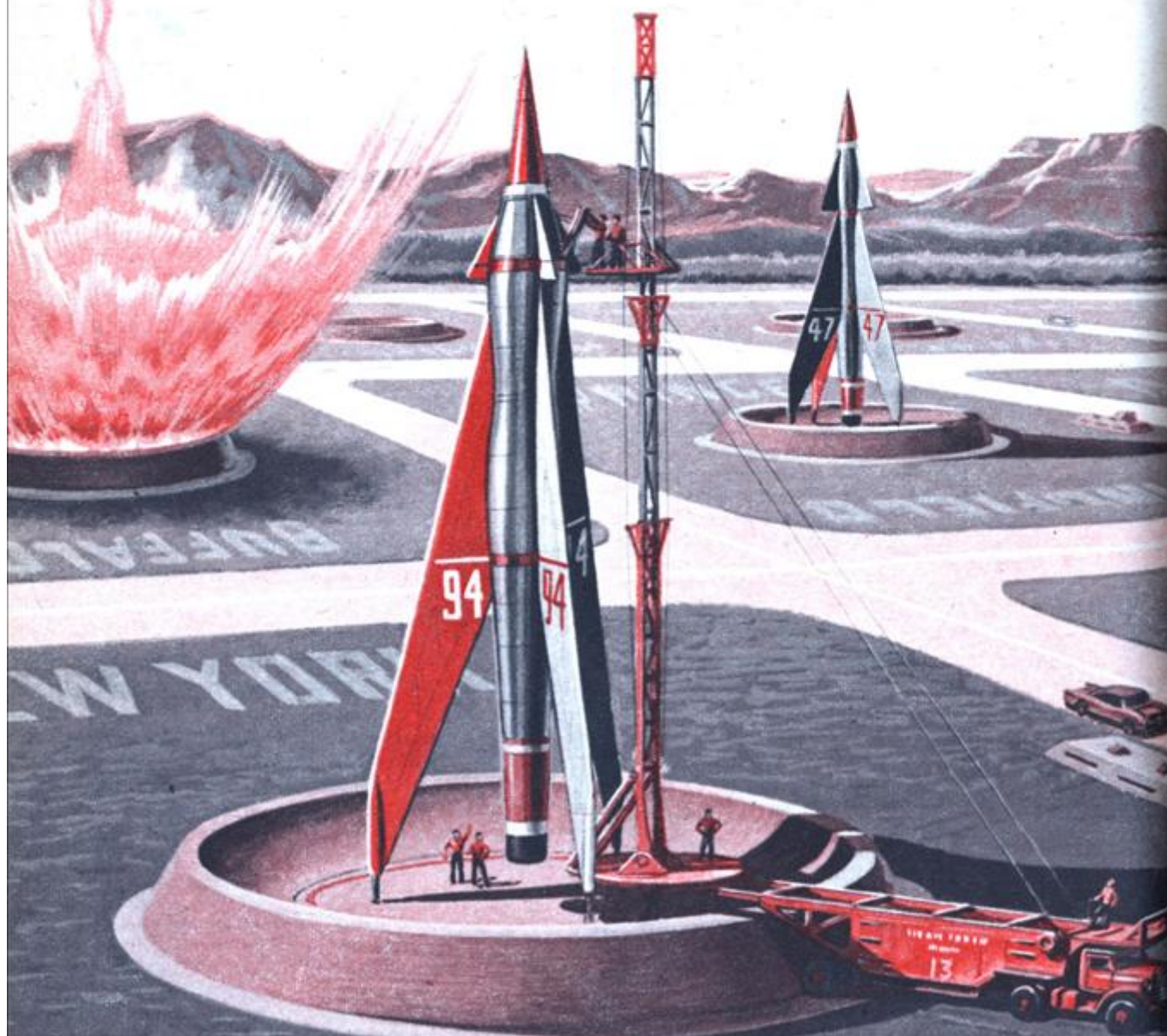


A missile expert predicts rocket mail by 1965. Here are MP's ideas on how the system could function.

By Frank Tinsley

IT'S Friday noon. In the home office of a giant New York corporation the final drafts of a secret merger are being signed. If they can be signed by the party of the second part in San Francisco and be back here in the office before the stock market closes—so that "buy" orders can be rushed to dealers throughout the country—a possible Monday financial slump can be averted. The atmosphere is tense.

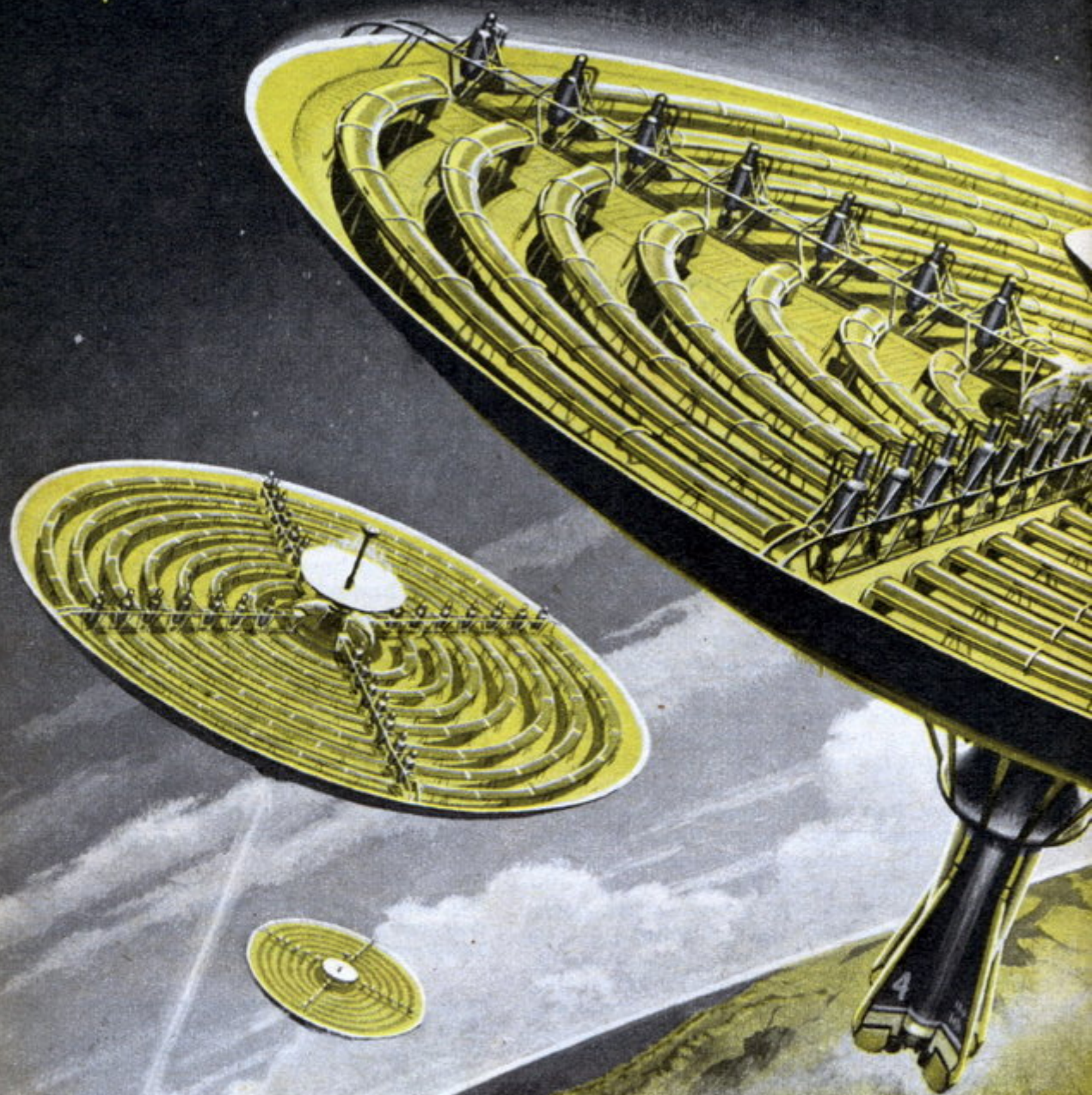
A micro- [Continued on page 175]





Should earth's food supply grow scarce, science will look to algal culture and . . .

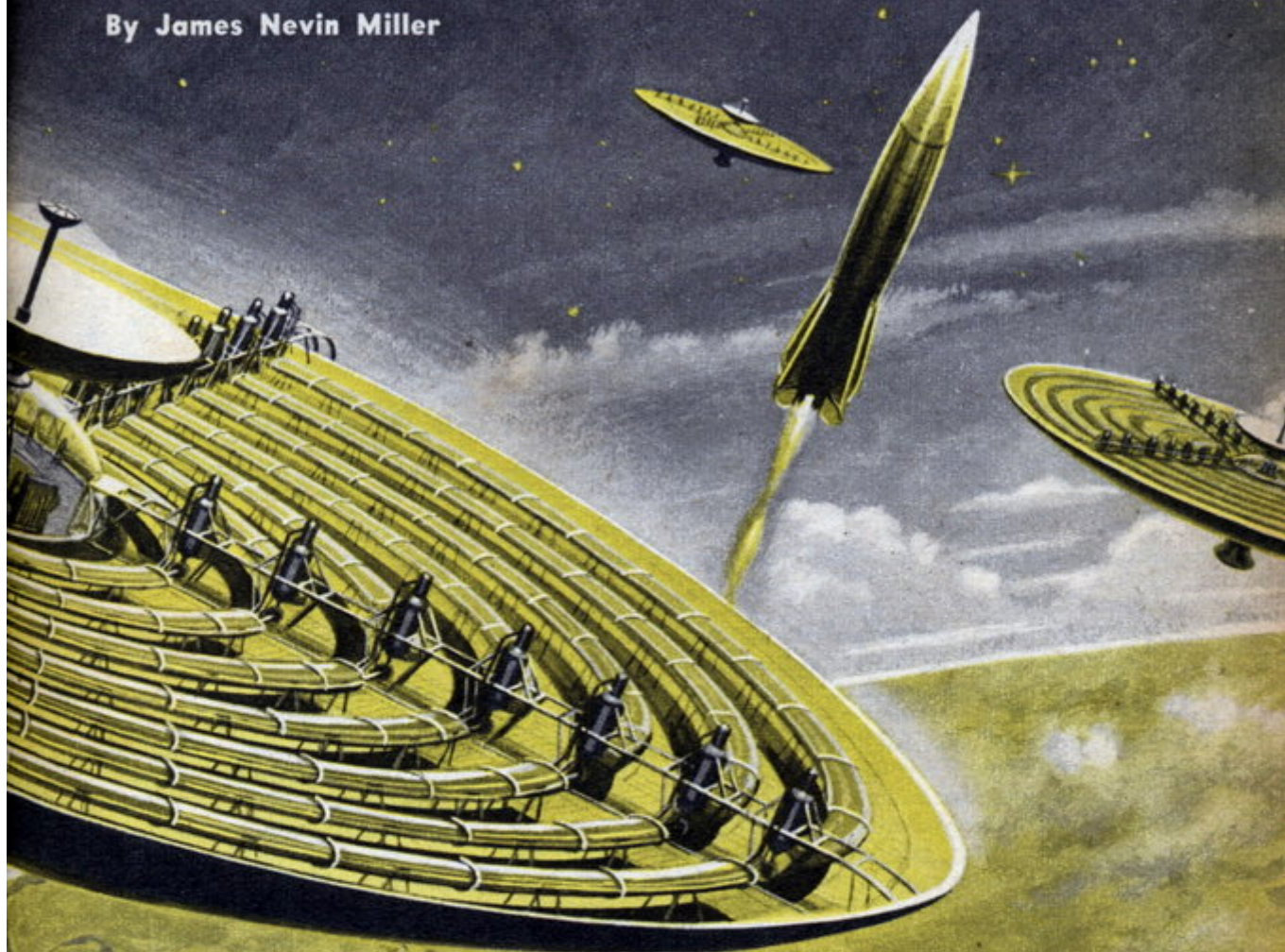
Moon Farms



MI artist Frank Tinsley has designed this saucer-shaped space farm. Growing tubes are concentrically arranged on the upper deck; drying and collecting equipment, storage bins, living quarters, etc., are in the shallow bowl beneath. A solar power plant (Sept. '53 MI) is set above the saucer, generates current to operate auxiliary mechanisms. Electric eyes coupled to servo gyroscopes keep both reflector and deck continually facing the sun. Air locks give access to a deck for inspection and maintenance. Each plastic trough is maintained as independent unit. Every day a space cargo ship makes contact with the tubular dock in the satellite's belly to milk it of its produce and transport it to earth.

to Banish Starvation

By James Nevin Miller

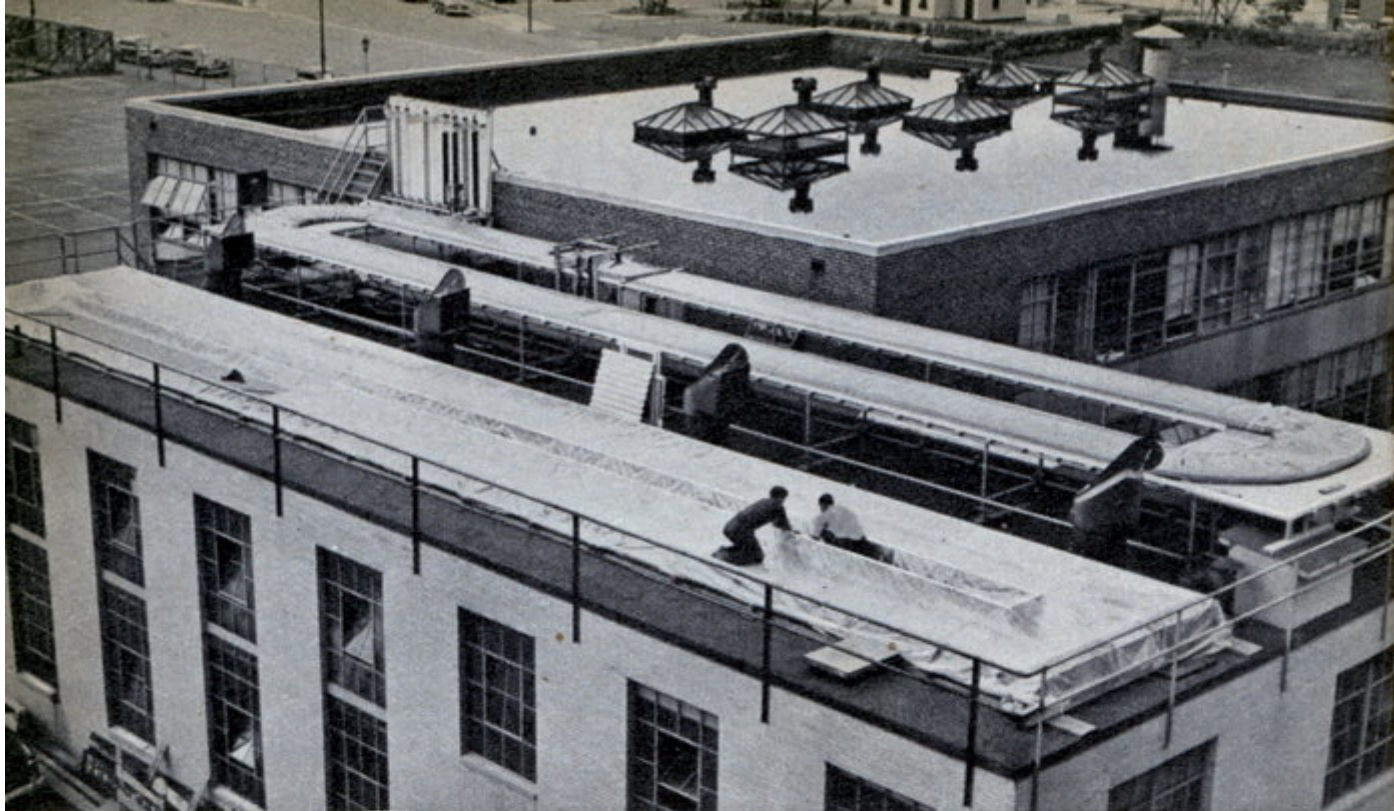


FIFTY years from now much of the world's food may be grown high in the sky! Tomorrow's farmers may raise their crops on artificial "moons" that have been launched into space and move in orbits around the earth. And the successful agriculturalist will probably be a combination chemist, biologist and engineer.

Fantastic as it may sound, this revolutionary type of farming is more than possible. Five years of intensive research in this country and 60 years of study by five other nations have

explored its potentialities. This news comes from the very conservative Carnegie Institution of Washington which has released a 357 page report on the almost unbelievable new science of "algal culture."

The report gives special emphasis to plants known as algae, especially the type called *Chlorella* which are grass green in color, microscopic in size and have cell walls composed of cellulose and pectins. In case these rarely mentioned growing things are unfamiliar to you, they are the ex-



Scientists conduct tests to make food crops from microscopic algae atop Cambridge, Mass., buildings.

tremely primitive, one-celled plants that sometimes make green scum on stagnant water. It is these algae that may radically change the world's eating habits and also provide the fuel that will be urgently needed when present stocks of coal and oil are depleted.

Some day, the report makes clear, this new agriculture may produce, on a single farm the size of the state of Rhode Island, half the essential protein foods needed by the earth's 2,400,000,000 persons.

No less startling is the prediction that civilization's total annual food and energy requirements 50 years hence might be produced on less than a fifth of the planet's surface. Included will be all the fuel for industrial power production such as heating, lighting and transportation.

If moon farms are used, man will be able to grow enough food to feed himself and his domestic animals and in addition produce all the heat and energy he requires.

The farms, both in the sky and on the ground, will resemble a farmer's nightmare. They will consist of gigantic tanks filled with algae, water and necessary plant nutrients, kept in an atmosphere enriched with carbon dioxide. The water will be continuously circulating in the tanks so that the algae will be exposed to sunlight every

few seconds. The energy for circulating the water will be supplied by using dried algae themselves as fuel.

The major purpose of this weird-sounding project is to provide cheap food for mankind. The algae, the Carnegie-sponsored experiments have shown, contain enormous amounts of protein, the food element most lacking in many areas of the world. Proteins are the body's building blocks and cost more than other foods. Their biggest source is meat which many people cannot afford in sufficient quantity although they are found in generous amounts in some grains and vegetables, too.

As Dr. John S. Berlew, editor of the report, explains:

"The possibility of growing a high-protein plant food in large quantities is of paramount importance in connection with long-range planning for the feeding of the ever-expanding world population. In many areas large numbers of people lack sufficient protein and therefore exist in a state of malnutrition.

"There is little hope of relief by the traditional methods of raising animals for food because of the large areas of land required to grow grass and other crops to support them. Furthermore the local production of fish is not always feasible. In this sort of situation algal culture may fill an urgent need."

Concerning the use of moving moons, Dr. Berlew has this to say:

"Still another potential application of algal culture might be in a space station. Ley, the famous German expert on space ships now in this country, has described recently the sort of structure being planned as an artificial satellite. A great deal of machinery will be needed in the space station to maintain pseudo-terrestrial environment suitable for man. The addition of an algal-culture unit for production of food for the inhabitants would not seem to increase in very large proportion the complexity of the structure and it would eliminate many costly trips of a space ship bringing food from earth, besides providing a supply of oxygen."

In order to fully appreciate the aims of the scientists in their spectacular new venture, it is important to bear in mind certain basic facts about algae. There are 17,000 species, ranging in size from those too small

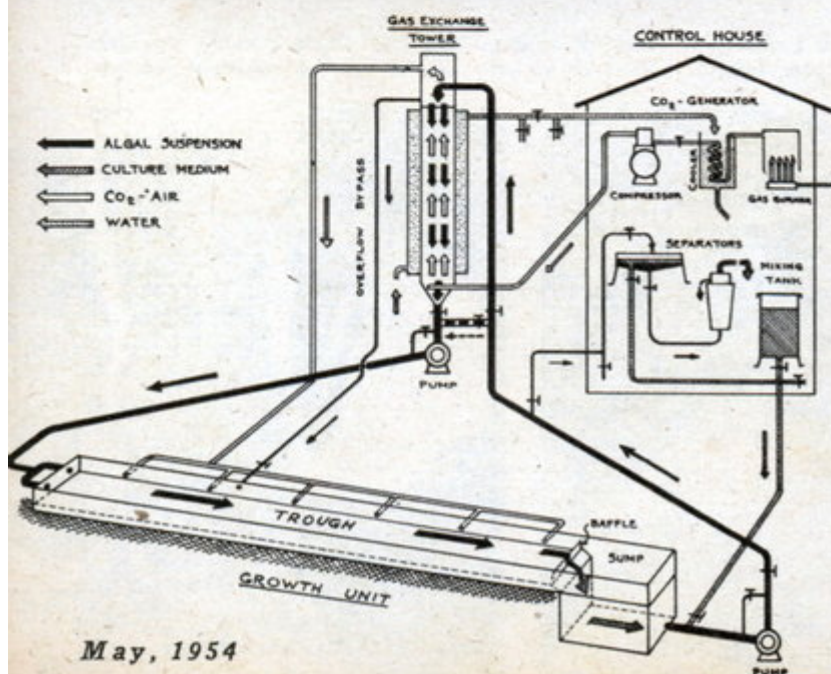
to be seen by the naked eye, to some oceanic species 100 feet long. In recent years a few species of *Chlorella* have been used as research tools by plant physiologists in the study of the mechanism of photosynthesis. One such investigation made about five years ago by Spoehrer and Milner showed that the protein composition of the single-celled alga, called *Chlorella pyrenoidosa*, could be controlled. This finding gave American scientists the idea that single-celled alga might be grown on a large scale as a source of food.

A vital fact to remember is that, barring accident, an algal cell does not die: it divides into more algal cells. There are about 20,000,000,000 cells in one quart of a bright green, moderately thin suspension of *Chlorella*. This is almost 10 times the number of people in the world!

The daily increase of such an algal suspension is also [Continued on page 216]



The experimental and successful algae farm in Japan consists of three units shown in picture at left. Growth unit is in foreground, control house and gas-exchange tower in the rear. Below, close-up of the gas-exchange tower which heats culture in cold weather. Diagram illustrates operation.



May, 1954



Why Don't We Have MOVING SIDEWALKS FOR



CITY SHOPPING



Conveyor-belt transportation would beautify our streets, reduce noise and help shoppers.

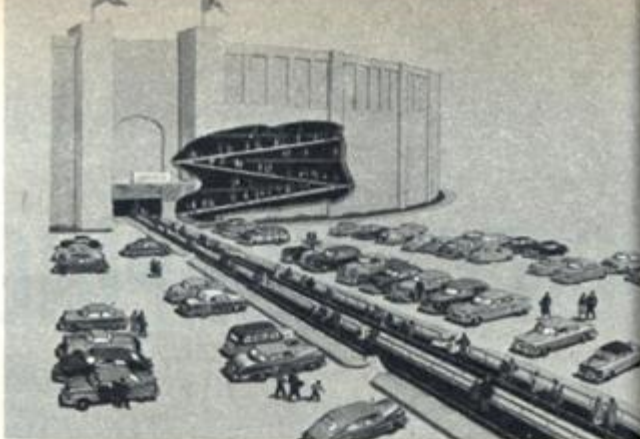
By Frank Tinsley

IMAGINE New York's famous Fifth Avenue devoid of all wheeled traffic. No taxis, busses or private automobiles, alternately jamming up at street corners and darting ahead at the change of lights. No grinding gears, roaring motors or noxious exhaust fumes. No swarms of nervous pedestrians scurrying back and forth at dangerous intersections. Imagine, instead, a leafy mall extending down the avenue's center, green with trees and bushes, brightened with flowers and flanked by a continuous stream of comfortable public cars, flowing smoothly along on silent, rubber belts. In them, milady sits and window-shops at a leisurely pace, hopping on and off at any point she desires. Imagine, too, a pair of subsidiary moving sidewalks with safe, convenient entrances and exits, upon which the pedestrian may ride along at a normal walking pace or gain easy access to the faster-moving cars.

Does all this sound like a hashish smoker's dream of a shopper's paradise? Not to the hard-boiled engineers of Goodyear's Conveyor-Belt Division with their long and impressive record of mass movement by



Subway conveyor belt, designed by Goodyear Tire and Rubber Co., could run under a huge shopping center with moving ramps leading to each store.



This sidewalk-and-ramp system might be adapted for use in huge parking lots at athletic fields or race tracks to take people from and to cars.

endless belt. Their conveyors have carried coal, stone, ore, grain and just plain dirt in fantastic quantity and at notable savings over conventional means of transportation. The belts can climb grades as steep as 32 per cent; maximum for trucks is 10 and for railroads only three. They can glide over rugged terrain impassable for anything but helicopters or aerial tramways. They can traverse spider-web bridges too frail to support even a light truck and slip through rat-hole tunnels in which a normal man could not stand erect.

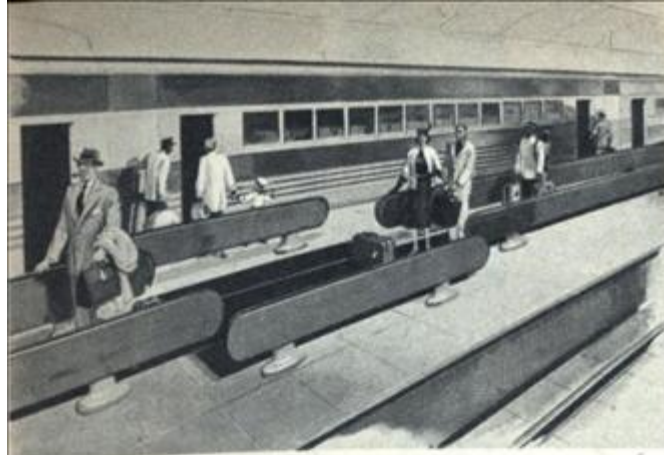
Rolling along at seven mph, the 36-in.-wide conveyor can move nearly 20,000 tons of coal in a 24-hour day, or enough ore in a week to fill 5,700 gondola cars! And it can do all this at a fraction of the power expenditure required by any other method of transportation. The "rubber railroad" can be astonishingly gentle, too. Despite frequent transfer—dropping the load from one overlapping belt-end to the next—a test lot of two dozen eggs in ordinary cartons traveled 4.3 miles over a coal conveyor with 18 belt changes and at the end of the line only five of the eggs were cracked!

The operating economy of conveyor transit has been proved on the hard anvil of commercial competition. In building the great Shasta Dam, Henry Kaiser's belt system beat the railroad bid to haul aggregate by seven-and-a-half cents per ton. It moved 12,000,000 tons of the stuff nearly ten miles for about 20 cents per ton and in four years this seemingly minor saving in price paid off the entire investment of \$1,750,000! Other belts have proven equally economical at the Grand Coulee Dam operation, Kaiser's mammoth cement plant in California and at coal mines and ore docks all over the world. In Seattle one of them levelled Denny Hill which squatted inconveniently between the business and resi-

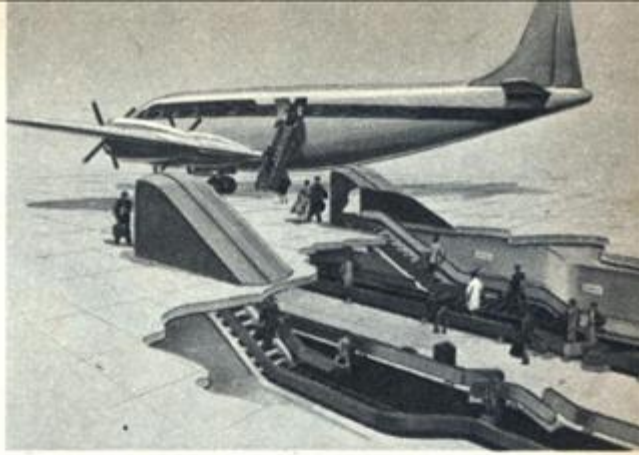
dential areas, dumping it into Puget Sound at a handsome saving.

From conveyor-belt transport of ore, grain and other bulk materials to the mass movement of human beings is but a minor step. The basic engineering problems are the same with only minor modifications necessary. The fundamental principal of mechanical carriage is, of course, an old and accepted one. For many years, the endless belt has functioned safely and satisfactorily as an Escalator or moving stairway, lifting untold millions from floor to floor of our great department stores, depots, subways, etc. The new version, rechristened a "Speedwalk," is nothing more than a simplified form of the old Escalator flattened out to run on the level. Various pilot models have been built and tested in recent years and the first commercial installation is now in actual operation. This connects the Jersey City stations of the Erie Railroad and the Hudson-Manhattan tubes, once infamous as a hot, heartbreaking bottleneck of daily commuter travel. Through the long, inclined tunnel, formerly called the "Cardiac Ramp" by weary suburban workers, there now runs a climbing sidewalk that wafts the rush-hour crowds from train to tube in effortless comfort. Designed by the Goodyear Industrial Products Division of Akron, Ohio, and the Stevens-Adamson Manufacturing Company of Aurora, Illinois, it transports as many as 10,800 persons per hour up and down the 10 per cent incline at about half the normal walking speed.

The Jersey City speedwalk is looked upon as the practical test installation for the far more elaborate "rubber shuttle" linking New York's Grand Central and Times Square subway stations (see July '53 MI), that will be built this coming winter. It is also a forerunner of a whole series of projected moving sidewalks that



Railroad terminals of the future will have constantly-moving belts on the platforms, synchronized with others at loading, unloading points.



Still another Goodyear conception is this commercial air terminal that incorporates Escalators and platforms, all traveling at same speed.

will ease the customers' bunions at mile-long airports, railroad and bus terminals, supermarkets, stadiums, outsize parking lots, etc. Many of these are already in the blueprint stage and will soon be running.

Now that the man-carrying conveyor has come of age, even more elaborate projects are in the works. A second-story speedwalk has been designed to run from city parking garages, across busy street intersections and through adjoining hotels, stores, theatres and restaurants, in a loop encompassing a whole shopping center. Customers will leave their cars at the parking point, ascend an Escalator to the floor above and be carried effortlessly on their round of shopping or entertainment, safe from the dangers of street crossings and inclement weather. It will be the first completely mechanized and protected home-to-shop-to-home service.

There is no reason why the same idea should not be applied to street-level transportation, as well. Shown in the illustration on pages 58 and 59 is MI's conception of New York's Fifth Avenue of the future. In place of the present mess of slow-crawling automotive traffic is a continuous belt-borne line of small passenger cars, moving in endless procession around a landscaped mall which extends from 58th to 14th streets. Two car types are shown, open and covered. A convertible model could easily be designed also. Each contains nine seats, facing the store fronts and stepped up in bleacher style to permit comfortable, unimpeded window shopping.

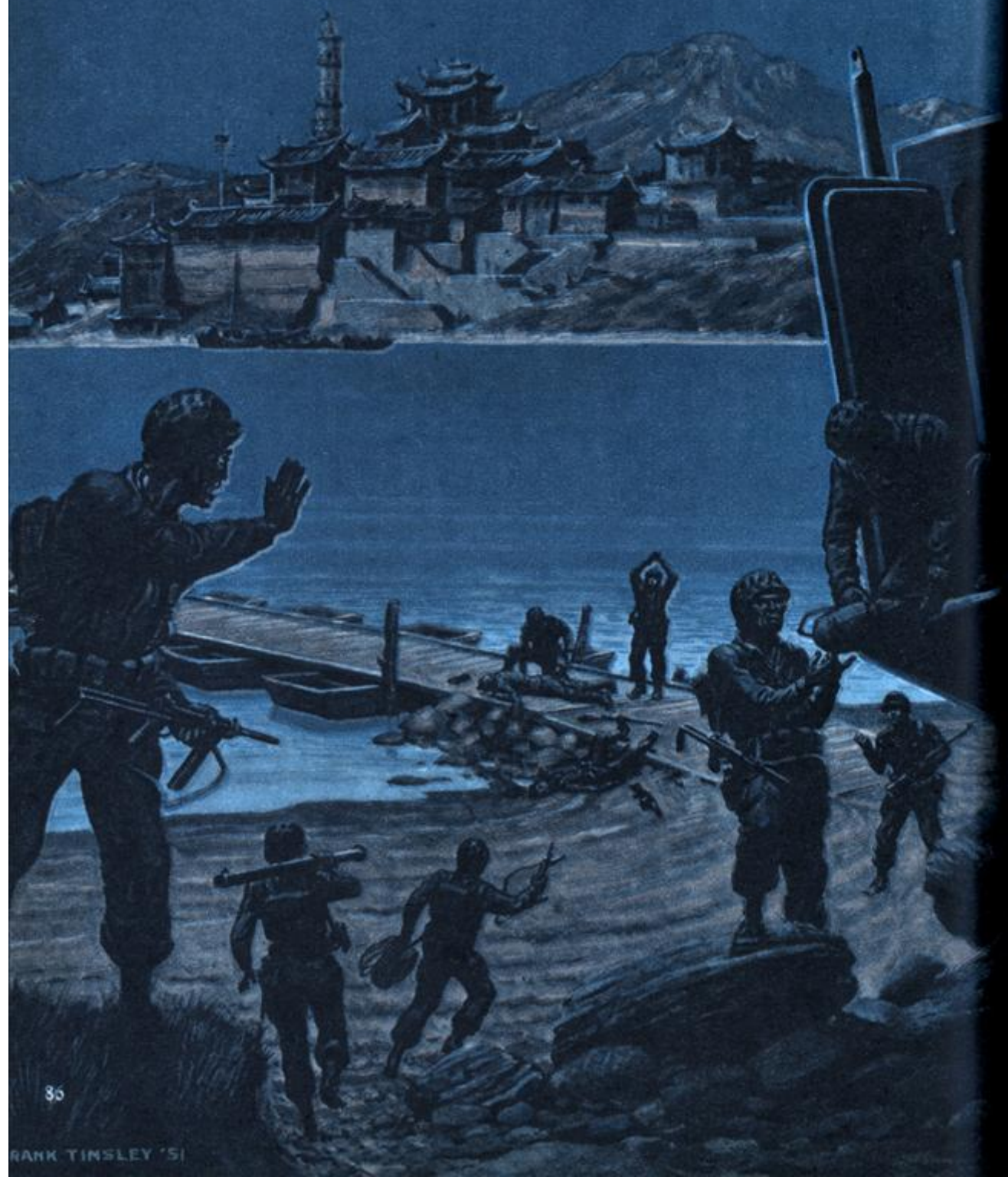
Passengers can enter or leave the cars at any point via an adjoining speedwalk that travels at the same rate of speed—three mph. Through frequent entrance and exit strips they then step to a slower belt that moves at walking speed—1½ mph. From this, easy access to the fixed sidewalk is possible. The shopper thus has a choice

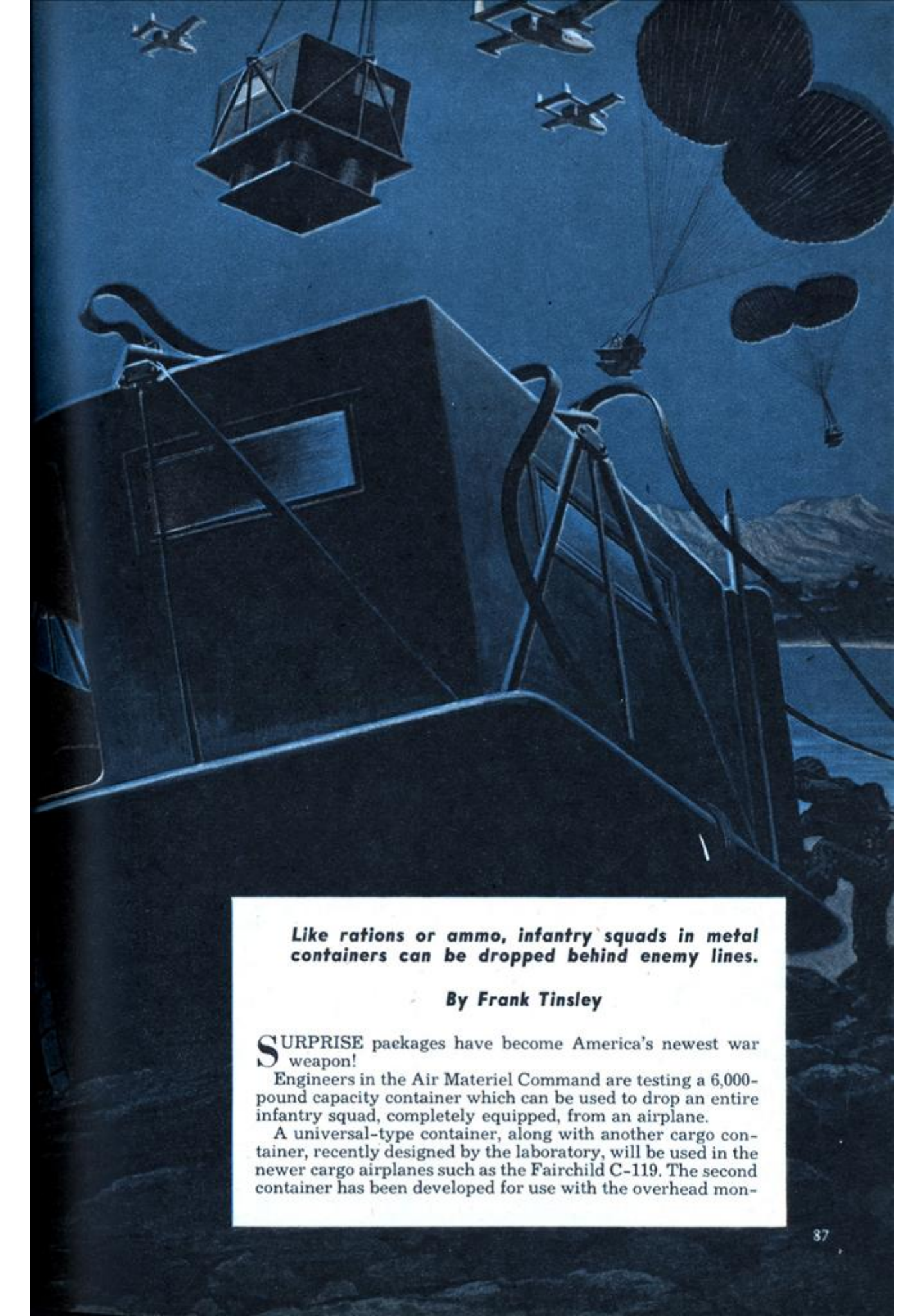
of normal strolling in either direction on static sidewalks; riding or "speed walking" in one direction on slow or fast conveyor belts, and finally, for longer distances, sitting in a three-mph car. The moving sidewalks run up one side of the avenue and down the other with overpasses every block or so for easy crossing. The proposed speedwalk set-up is purely local, designed to expedite pedestrian movement in concentrated shopping districts. Long-distance bus lines connect with the uptown and downtown ends and crosstown lines slip beneath it through underpasses. Side streets end at the avenue in traffic turn-arounds, permitting the close approach of trucks, taxicabs and other surface vehicles. In an emergency, ambulances or fire apparatus can move up and down the avenue itself on the static sidewalks.

In large cities like New York, a series of similar conveyor-belt transportation systems, all connected together, could have still another advantage, especially if they went in two different directions. Since people would be able to go anywhere in the city without using a bus, taxi or private car, congestion would be relieved all over, even on those streets and avenues that were open to regular traffic. Commuters' cars might be parked in lots outside the city.

Goodyear engineers believe that the present bus, taxi and private-car traffic exists solely to move shoppers and strollers to stores and other establishments along our famous avenues and boulevards. The speedwalk system described would perform the same function far more cheaply, comfortably and efficiently. It would rid our proudest thoroughfares of noise, fumes and traffic confusion. The method, materials and know-how lie ready to hand. Why don't we put them to use and have modern moving sidewalks for our great shopping centers? •

PARATROOPS by the PACKAGE





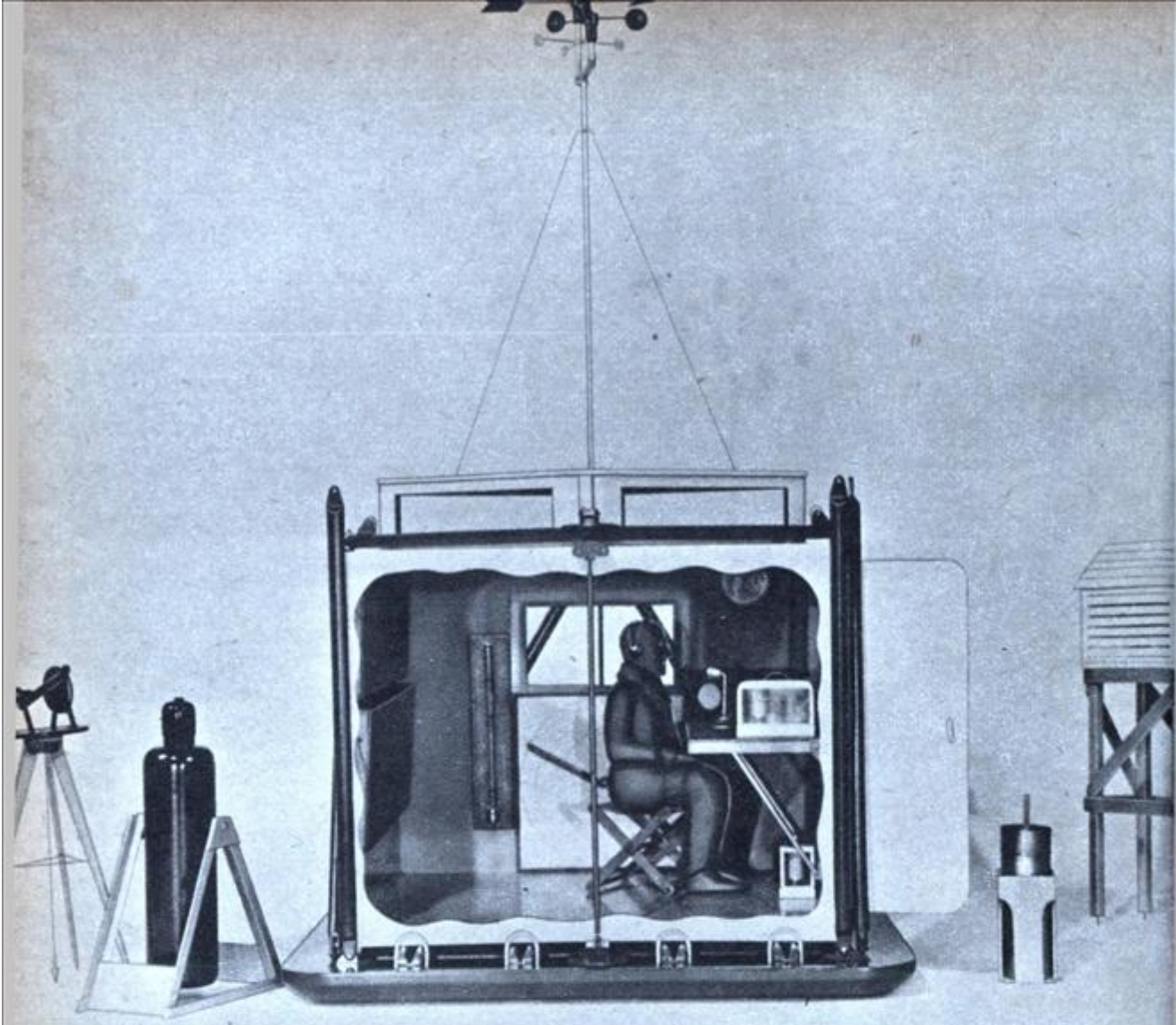
Like rations or ammo, infantry squads in metal containers can be dropped behind enemy lines.

By Frank Tinsley

SURPRISE packages have become America's newest war weapon!

Engineers in the Air Materiel Command are testing a 6,000-pound capacity container which can be used to drop an entire infantry squad, completely equipped, from an airplane.

A universal-type container, along with another cargo container, recently designed by the laboratory, will be used in the newer cargo airplanes such as the Fairchild C-119. The second container has been developed for use with the overhead mon-



orail of the C-119. Still in an early research and development stage, the universal container holds great promise. Besides its use as a transporter of infantrymen and equipment, engineers foresee its utilization as a complete weather station, rescue station and survival and rescue hut for Arctic use. Military Air Transport Service already is considering it as a weather station, to be dropped with men and equipment into inaccessible areas.

The container consists of a framework of tubular sections mounted atop a metal landing skid provided with plywood flooring. Four movable aluminum triangular compartments are attached to the framework. They can be arranged as a square box to carry cargo or can be rearranged to carry troops. The framework will not obstruct the exit of troops if they are forced to bail out during an emergency. It is quickly removable for easy loading and unloading.

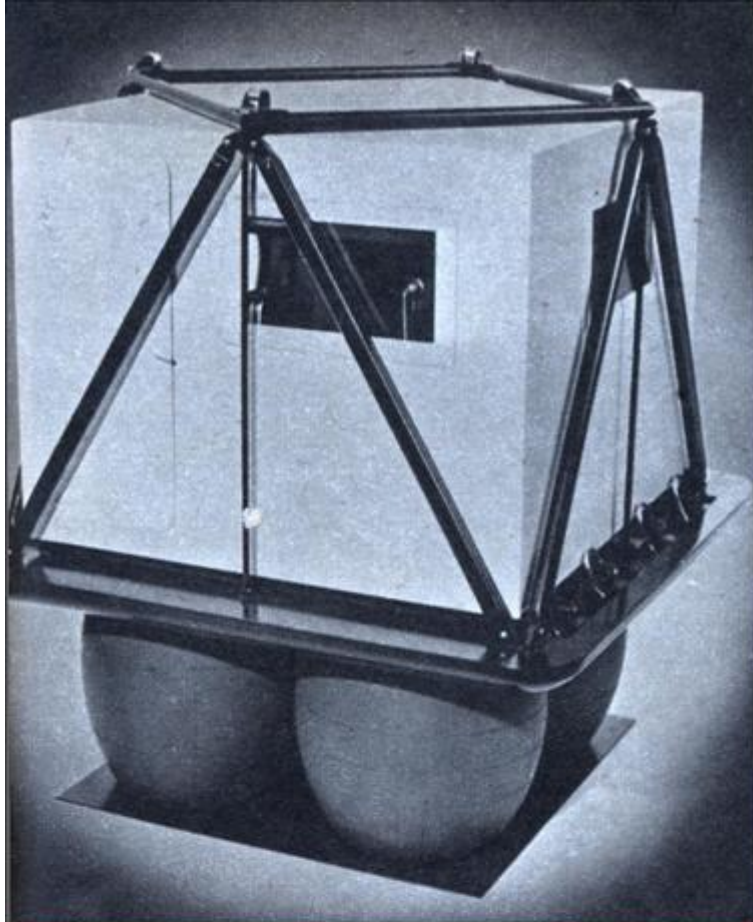
Two types of parachutes may be used for the descent—a single 100-foot chute for

loads up to 3,500 pounds and two 100-foot chutes for loads up to 6,000 pounds. The parachute assembly is placed atop the container. Then, a small pilot chute pulls out the 16-foot extraction chute, which pulls the container out of the airplane.

Landing or impact deceleration is provided by four large air bags constructed much in the shape of barrels. They are fastened underneath the skid and remain completely deflated until the container is dropped from the aircraft. One-way openings in the bags permit air to rush in during descent, inflating the bags so they form a cushion to absorb most of the landing impact.

The container, which is designed to withstand a landing shock of 6 G's, measures 96 inches square and 70 inches high. Four of the 500-pound units will fit into the C-119.

Ground operation is possible with the use of four wheels, one on each corner of the container. They are removed when the device is loaded into the aircraft and may be carried along for use after landing.



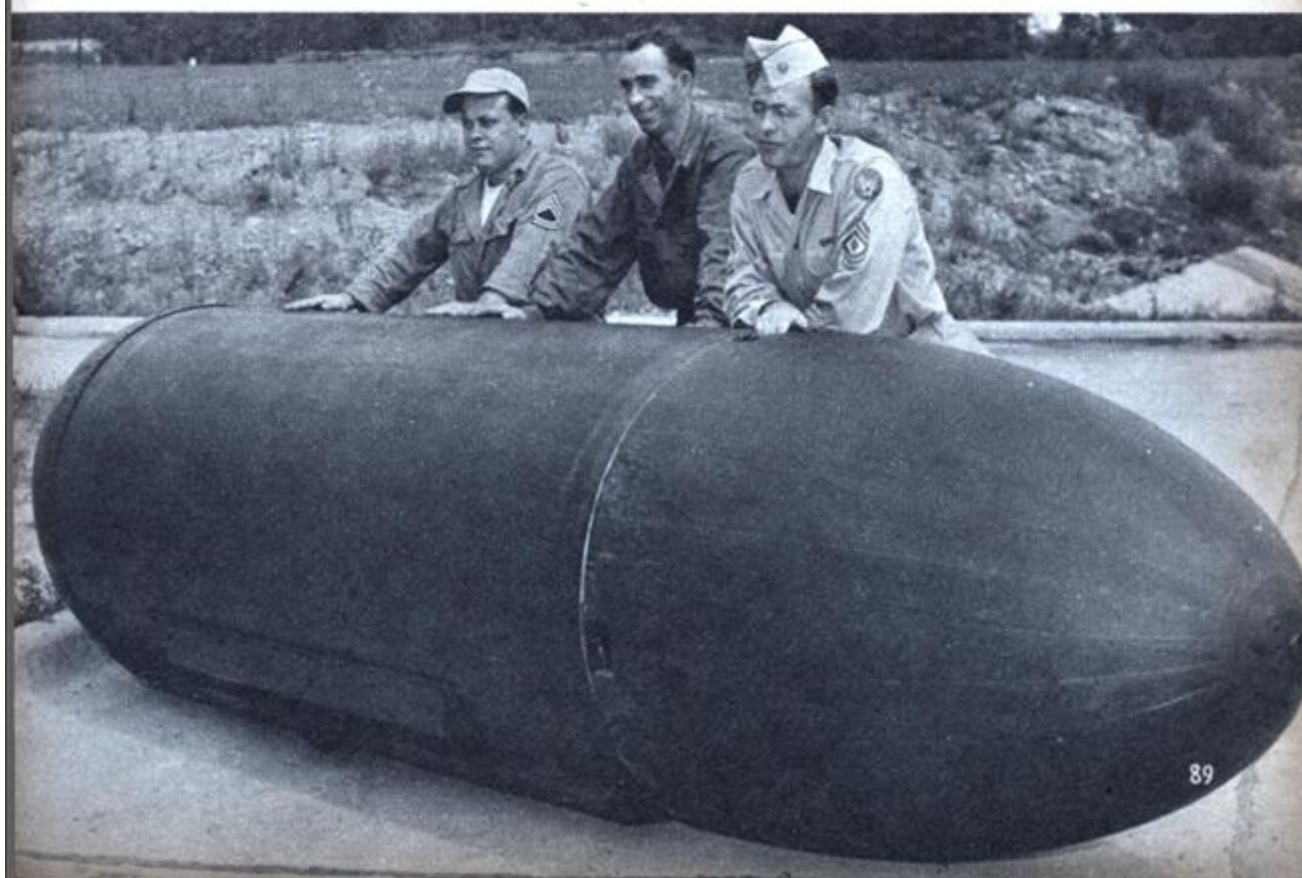
Equipped as a weather station, left, the 6,000-pound capacity metal containers can be dropped in isolated areas. Barrel-like rubber supports, above, inflate themselves during descent and act as shock absorbers.

The other type of container, designed for use with the C-119 overhead monorail, has a 500-pound capacity. It can drop such equipment as small arms, ammunition, fuel and food. To land this container, an expendable 24-foot muslin parachute is used. Tests indicate a 500-pound load can be dropped safely at an aircraft speed of 175 mph. A 400-pound load can be dropped at 225 mph. Overall dimensions of the container, fully packed, are 20 by 30 by 60 inches.

Air Materiel Command engineers have not yet jumped in the revolutionary containers although indications are that the first descents will be made soon. When they do take place, it will be the first time U. S. Air Force personnel has ever descended in just an enclosure.

If the time comes when these weapons must be used, our enemies will discover that while good things come in little packages, knockout blows come in slightly bigger ones. •

During the last war, the Germans used metal containers equipped with four parachutes, like the one below, to drop saboteurs behind Allied lines.



Will Polar Waves Swamp

Engineer Brown fears the vast Antarctic icecap may upset the world and drown us in a great flood at any moment!

By West Peterson



America?



TURN PAGE

FRANK TINSLEY



Survivors of our toppled world would discover a weird jumble of ancient shipwrecks, rotting whales and stranded liners as they trekked to safety across the dry, cracking ocean bottom.

Will Polar Waves Swamp America?

FARMER Williams was plowing the field back of his red barn in central Indiana shortly before noon. A few more furrows and he could quit for lunch. Then above the regular clatter of his tractor he heard an ominous, ground-shaking rumble. He turned on the tractor seat—and saw a towering mountain of water roaring down upon him.

The sweeping wave brought death to Farmer Williams and churned the Midwest into an inland sea.

This may be the doom of America and our world as we know it. And that doom may crash upon us at any moment, according to Hugh Auchincloss Brown, 69-year-old electrical engineer of Douglaston, Long Island.

Engineer Brown firmly predicts this battered old earth is long overdue for another great flood unless we can put off our Day of Doom with a \$10,000,000 atomic project.

Brown declares we must blast the Antarctic icecap with atom bombs!

It sounds utterly fantastic. Yet the theory has received serious attention in the press and certain scientific circles. Brown, a modern-day Noah, has spent much of his spare time over the past

35 years in building up his theory. He has even printed a treatise entitled "Popular Awakening Concerning the Impending Flood."

Here are the two premises stated in the foreword to Brown's work:

"1. The earth rotates on its present axis because of the centrifugal force caused by its equatorial bulge, which became established at the time of the latest flood. The centrifugal force of that bulge alone now temporarily prevents its rotating about some different axis.

"2. The centrifugal force of eccentric rotation of the great South Pole icecap tends to careen the globe. That force of rotation will roll the earth over and move Antarctica and its icecap almost directly under the sun because in due time it will neutralize and overcome the centrifugal force of the earth's bulge. During the reeling period the earth will experience another of its recurrent great deluges when most living things perish. . . ."

In other words, according to Brown's forecast, the weight of ice at the South Pole is going to pull the "wobbling" earth off its present axis. After the globe tilts the North Pole may be found somewhere

in the equatorial Pacific, with the South Pole in Africa.

Brown cites two factors which, combined, will cause the shift.

In the first place, he asserts, it was discovered as far back as 1895 that the earth is spinning off-center. Astronomers over the past half-century have noted that the poles are "wandering."

Secondly, the icecap at the South Pole is constantly growing. When the weight increases sufficiently, it will throw the earth off its present orbit completely.

It's happened before at 8000-year intervals, the engineer says, and it's bound to happen again! But Brown declares it is impossible to set any definite date for the disaster. His Doomsday may come in the year 2000, or 2048—or tomorrow!

The danger lies at the South Pole instead of the North, according to Brown, because the latter has a relatively small amount of ice. Here's how he describes the Antarctic menace:

"Before the latest career of the globe, there was no ice in the land of Antarctica. Since then, for approximately 8000 years, the icecap has grown slowly . . . until now it covers an enormous area and is pyramided two miles high at the South Pole. . . . This growing icecap has become a stealthy, silent, relentless force of nature and is the glistening menace, the creeping peril and divinely appointed executioner to the civilization of our epoch of time."

With the shift in the earth's axis, Brown contends, much of the world will be flooded. Perhaps the only survivors will be the Eskimos—if they can adapt themselves to a sudden switch to the tropics.

After the New York engineer's theory was published, scientists of the U. S. Geological Survey scoffed at it. They said they doubted most strongly that any existing polar ice masses were likely to tip over the globe. Further, they declared, if there were indeed such a threat, atom bombing would not make much of a dent in the ice.

Brown took this criticism calmly, and remarked that no prophet of doom is ever popular. And he went on to give the details of his plan to preserve the earth as we know it.

"First," he says, "we must make a careful survey of the antarctic ice, which would cost in the [Continued on page 79]

If the weight of the polar ice suddenly tips the earth, the oceans would slosh from their beds like water in a jostled cup and flood low continents. Tropics would quick-freeze in a new Ice Age.



DO PREHISTORIC



MONSTERS STILL EXIST?



Future explorers may find themselves battling "extinct" creatures which lurk in the remote corners of the world.

DINOSAURS may roam the unexplored jungles of Africa!

Native tribes near the Congo River call the creatures Mokele Mbembe. They say they're enormous and live in caves washed out by the river at sharp turns. Some startled tribesmen

By Willy Ley

Author of *The Lungfish*,
the Dodo and the Unicorn*

have described them as having long necks, small heads and one long tusk. Others have told of a three-horned monster like that shown above, with ferocious teeth and a massive comb. All agree that the creatures kill both humans and elephants. But they never eat the

*The Viking Press, N. Y.

flesh. Farther east in Africa, near Lake Bangweolo, the natives tell of a weird animal which they call Chip-ekwe. Because it kills hippopotamuses, not one hippo can be found in the lake. One tribe claims it hunted and killed a Chipekwe forty years ago. The strongest hunters had to jab it with their spears for days before the animal finally succumbed.

There have been many other reports of strange creatures still uncatalogued. They have not been officially described and not yet pinned down with a Latin label. But in all corners of the earth there are people who will swear to what they have seen.

Of all the unknown animals, the one for which the best evidence has been offered is the apeman of the South American jungles. In 1929, a French geologist, Monsieur de Loys, made a trip into the interior of Venezuela. One day he camped on the banks of the Catatumbo River.

Suddenly, two hairy creatures approached the camp in fury. As they attacked him he fired. One of the attackers fell dead, the other fled. When de Loys examined the body, he found it was not a man as he had thought—it was an ape!

He knew he had really discovered something because it had always been thought that there were no apes native to the Western Hemisphere. He propped the body up on a crate and took pictures. It was five feet tall, had 32 teeth, a nose like that of South American monkeys, and no tail at all. Then he cut off the head in order to bring home the skull. But a later accident to the expedition resulted in the loss of the skull although the photos were saved.

So far, this strange apeman of Venezuela has never been found again.

Tales of natives and explorers cannot be discounted. The famous African explorer, Stanley, and other early hunters were told about an animal living in the Congo which had stripes. It sounded like a zebra but since zebras live in open plains, the white



men were doubtful. Later the animal was actually "discovered"—it was the okapi.

The natives also wore feathers in their headdresses which did not come from any bird known to science. Then this bird was "discovered"—the Congo peacock.

And in Liberia, German hunters heard stories about a very large black pig with treacherous teeth. They didn't believe them until one day a hunter was actually attacked by the animal—the pigmy hippo.

And the fishermen along Norway's coast have insisted for hundreds of years that two sea monsters exist. One, they say, looks like a long snake. The other has a head like the roots of a big uprooted tree. But the roots are alive and squirming—with two gigantic eyes. The first monster the fishermen call the Sea Worm and the second, Kraken.

Way back in 1861 the commander of a French man-of-war came back and told of an encounter with an 18-foot octopus of brick-red color. The crew shot cannon balls at it. When they hoisted it aboard, the creature decayed so rapidly it was thrown overboard.

The largest octopus ever taken had a ten-foot body, two long arms about 30-feet long and two short arms about seven feet long. Some varieties of toothed whales



MONSTERS, TODAY AND YESTERDAY: these two creatures are about 4-million years apart. The present-day Iguana, at far left, grows to a length of six feet, is a throwback to the extinct (scientists say) Therapod. This creature, below, which grew to a height of 22 feet and a length of 48 feet, roamed North America in prehistoric days. A six-foot man would be dwarfed by the beast.

like to eat octopus—and they don't seem to care about the size so long as they can swallow the creatures.

One such whale, on being harpooned, vomited recently-eaten food during its death struggle. In that mess, the men found a piece of octopus tentacle six feet long with a diameter of two feet. The diameter of tentacles of the biggest specimen previously seen had been only eight inches!

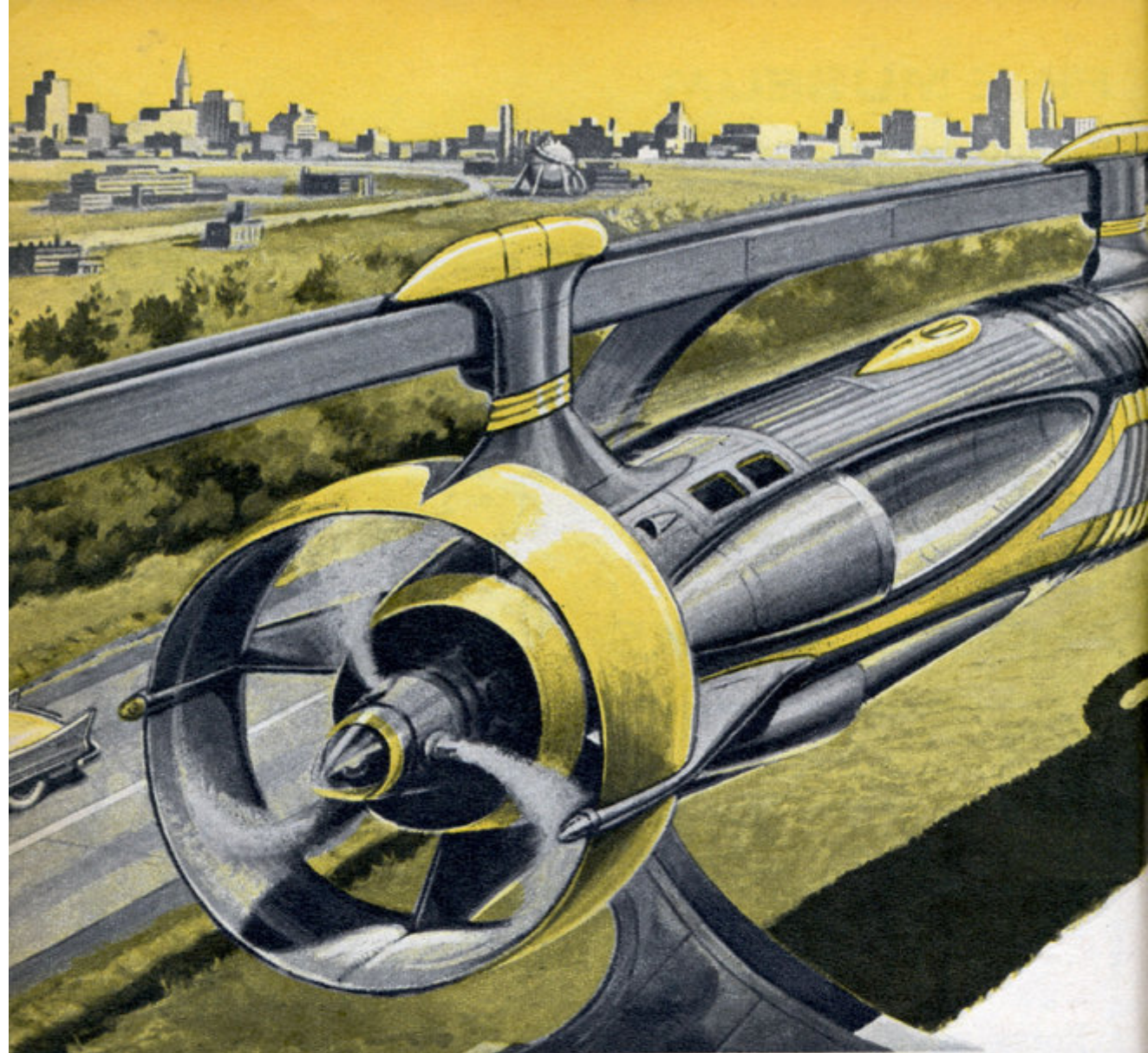
On the skin of another toothed whale, fishermen found the mark of a sucking disk two feet in diameter. The tentacle to which it was attached must have been even thicker. The octopus to which tentacles and sucking disks of this size belong, must be of enormous dimensions.

As for "ordinary" sea serpents—they have been seen on almost all shores at least 200 times. The latest case is that of the SS Santa Clara. This ship literally ran into one in the Gulf Stream at about noon on December 30, 1947. There was lots of blood in the sea and the captain of the vessel thinks his ship may have cut the animal in half.

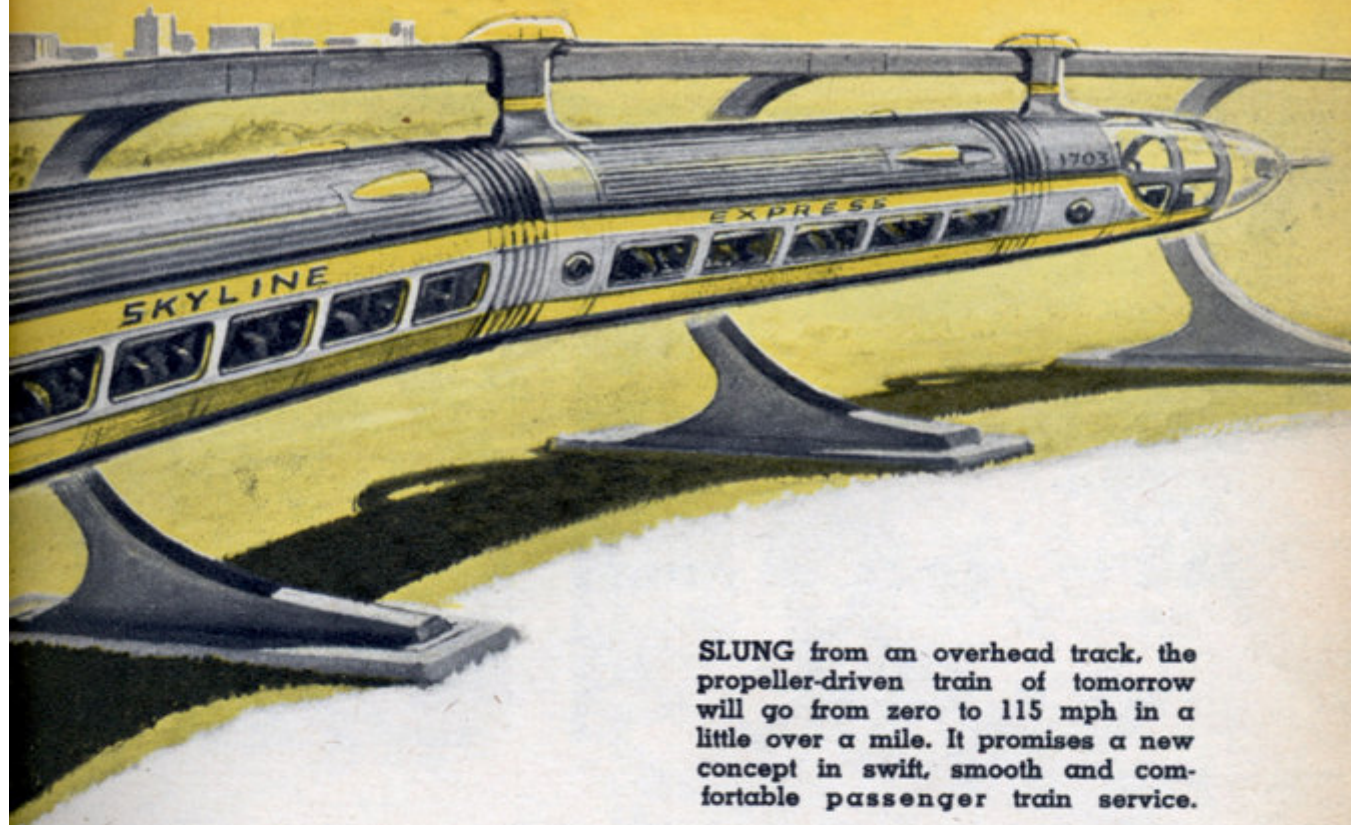
There are other unrecognized creatures of the sea, too. A turtle-like monster has been reported on Easter Island and in Queensland. It's called Nuihi on Easter Island and Moha- [Continued on page 144]

This is an ancient engraving of the Kraken—a ferocious sea serpent with squirming tentacles and two gigantic eyes which supposedly preyed on Norwegian sailing vessels off the Scandanavian coast.





FRANK TINALEY '58



SLUNG from an overhead track, the propeller-driven train of tomorrow will go from zero to 115 mph in a little over a mile. It promises a new concept in swift, smooth and comfortable passenger train service.

PROPELLER-DRIVEN TRAIN

By Frank Tinsley

THE propeller-driven monorail train zooming out of New York's Pennsylvania Station accelerates from zero to 115 mph in a little over one mile. Its destination, Washington, D. C., will be reached in record time.

This revolutionary streamliner may soon become a reality. Curtiss-Wright Corp. has proposed powering high speed passenger trains with air propellers utilizing C-W's Turbo-compound airplane engine. Pennsylvania Railroad is considering this project, a possible solution to the American railroads' quest for economic and lightweight rolling stock.

The MI-designed PDT would be a monorail slung from an overhead track. Its jointed cylindrical body lends itself perfectly to effective streamlining and propeller drive.

The PDT engine at the rear is run by

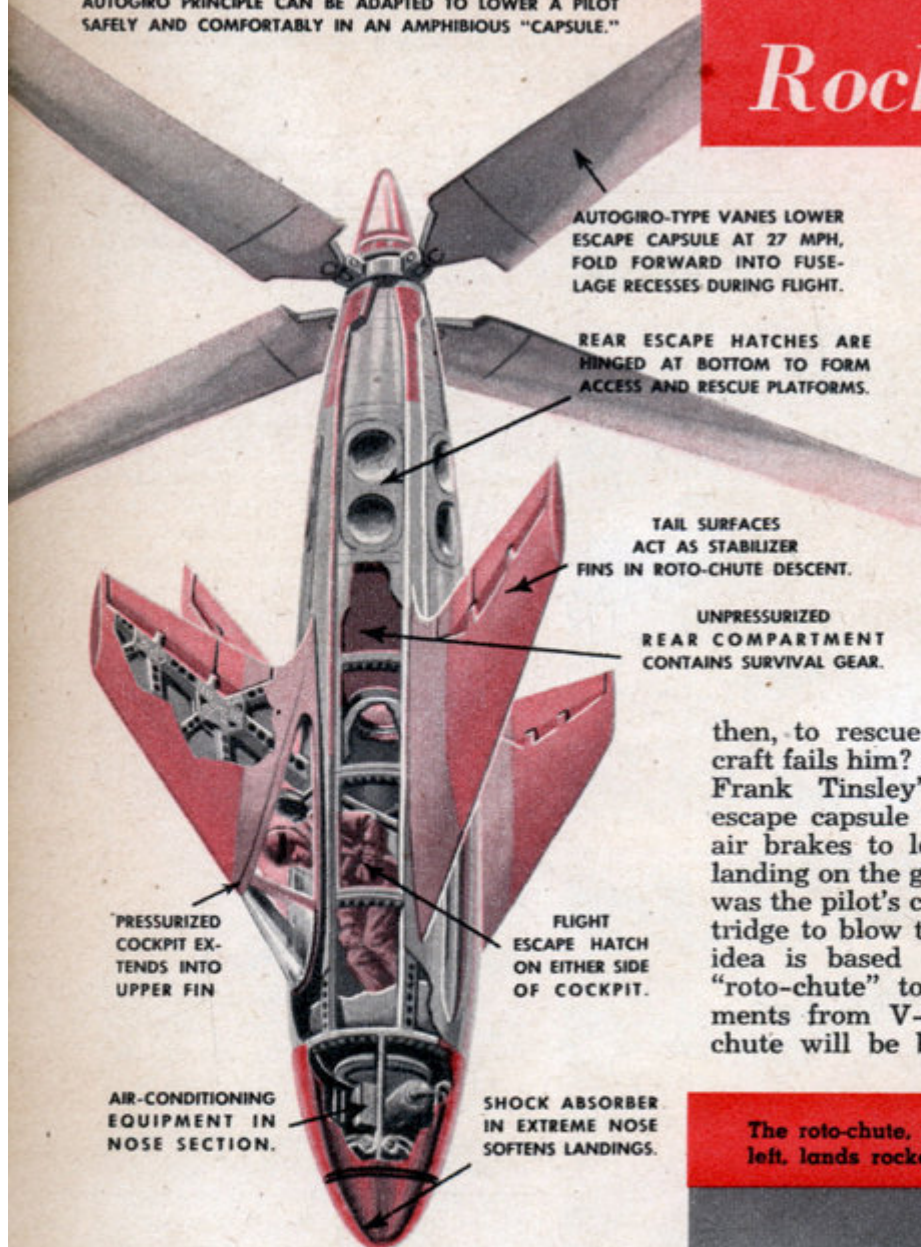
remote control from the cab at the front of the train. Instrument readings are made via closed-circuit TV. The three-bladed propeller is reversible, serving as a pusher in forward "flight" and as a puller for braking and reverse. Air for engine operation and cooling is sucked in through large scoops and expelled aft through the propeller blades, contained in a ring-like shroud for efficiency and safety.

Station platforms would be enclosed in glass (see illustration) because slipstream blasts would be formidable, even at low speeds. As the train brakes to a halt, the station access doors open outward to form windbreaks, and an extension platform slides out against the car's side.

Passengers would step off clean, relaxed and untired from what may be the train of tomorrow. •

Roto-Chute for Rocket Pilots

G.E.'S NEW "ROTO-CHUTE" MAY PROVE KEY TO EMERGENCY ESCAPE FROM SUPERSONIC AIRCRAFT. DESIGNED TO RETRIEVE INSTRUMENTS FROM HIGH-ALTITUDE ROCKETS, ITS AUTOGIRO PRINCIPLE CAN BE ADAPTED TO LOWER A PILOT SAFELY AND COMFORTABLY IN AN AMPHIBIOUS "CAPSULE."



SUICIDE is the word for the pilot who tries to escape from a supersonic plane by parachute. The billowing fabric 'chute was a wonderful aerial lifesaver—till Air Force pilots started streaking faster than sound in rocket planes like the Bell XS-1. The impact of the air at such speeds is so terrific that it will not only shred the parachute like a burst of shrapnel but also peel the flesh off the pilot's bones.

What can science do, then, to rescue the rocket pilot when his craft fails him? Look to the left, at MI artist Frank Tinsley's solution: a pressurized escape capsule with unfolding rotary-wing air brakes to let the flier down to a safe landing on the ground or at sea. The capsule was the pilot's cockpit before he fired a cartridge to blow the unit off to the rear. The idea is based on General Electric's new "roto-chute" to bail out research instruments from V-2 rockets. Soon, the roto-chute will be bailing out rocket pilots. •



FRANK TINSLEY

LANDING AT SEA, THE CAPSULE FLOATS UPRIGHT LIKE A BUOY, STEADIED BY ITS FINS AND ROTOR VANES. FOOD, WATER AND SURVIVAL GEAR KEEP PILOT ALIVE UNTIL RADIO AND POSITION LIGHT BRING RESCUERS.

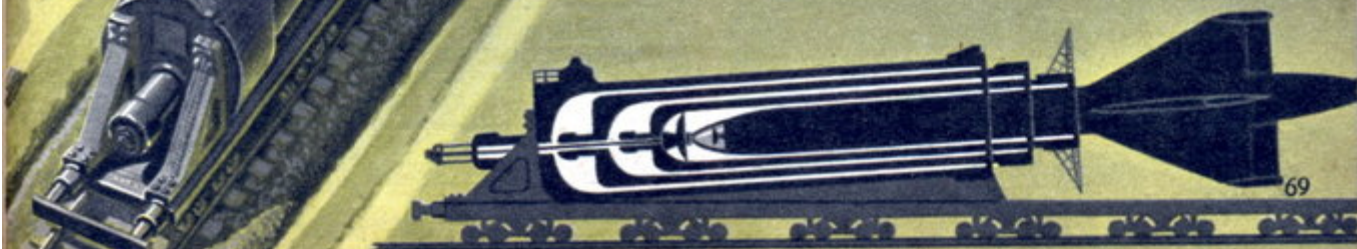
The roto-chute, invented by G.E.'s I. B. Bensen, left, lands rocket instruments at easy 27 mph.



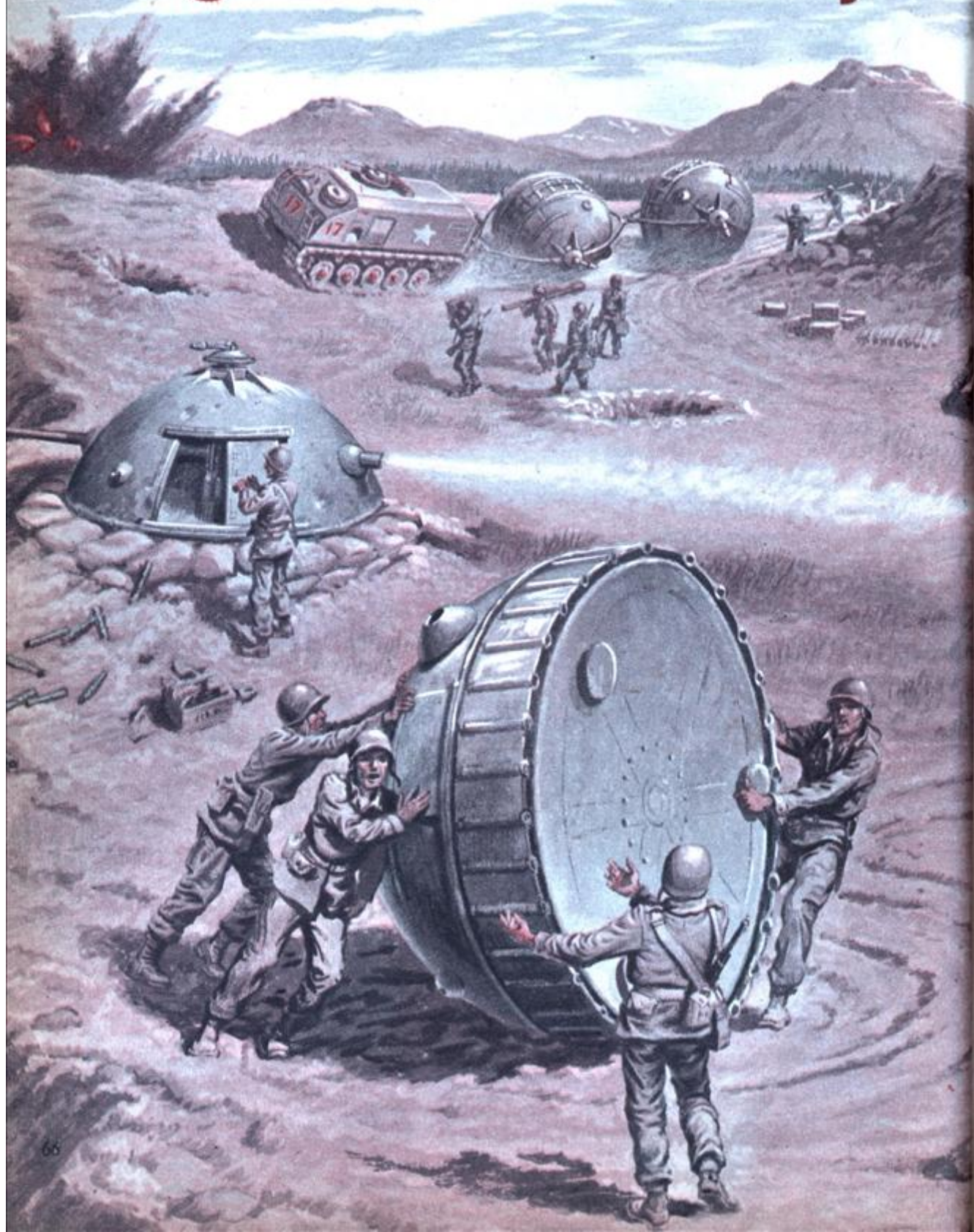
ROCKET CATCHER

IF and when space travel becomes a reality, there'll be the problem of landing high-speed rocket ships. D. B. Driskill of San Francisco thinks he has the answer in his U. S. Patent 2,592,873. He would build a system of telescoping tubes butted against a mountainside or mounted on skis or a train platform. The rocket ship would be guided into the end of the outer tube by radar. This tube would slide into the second tube, braked by air pressure, and then into the main tube. When pressure between the tubes is released, passengers would leave through doors in their walls. •

Drawing below shows rocket catcher in final position. Tubes are collapsed and rocket has "landed."



Why Don't We Have... Rolling Pillboxes for the Army?



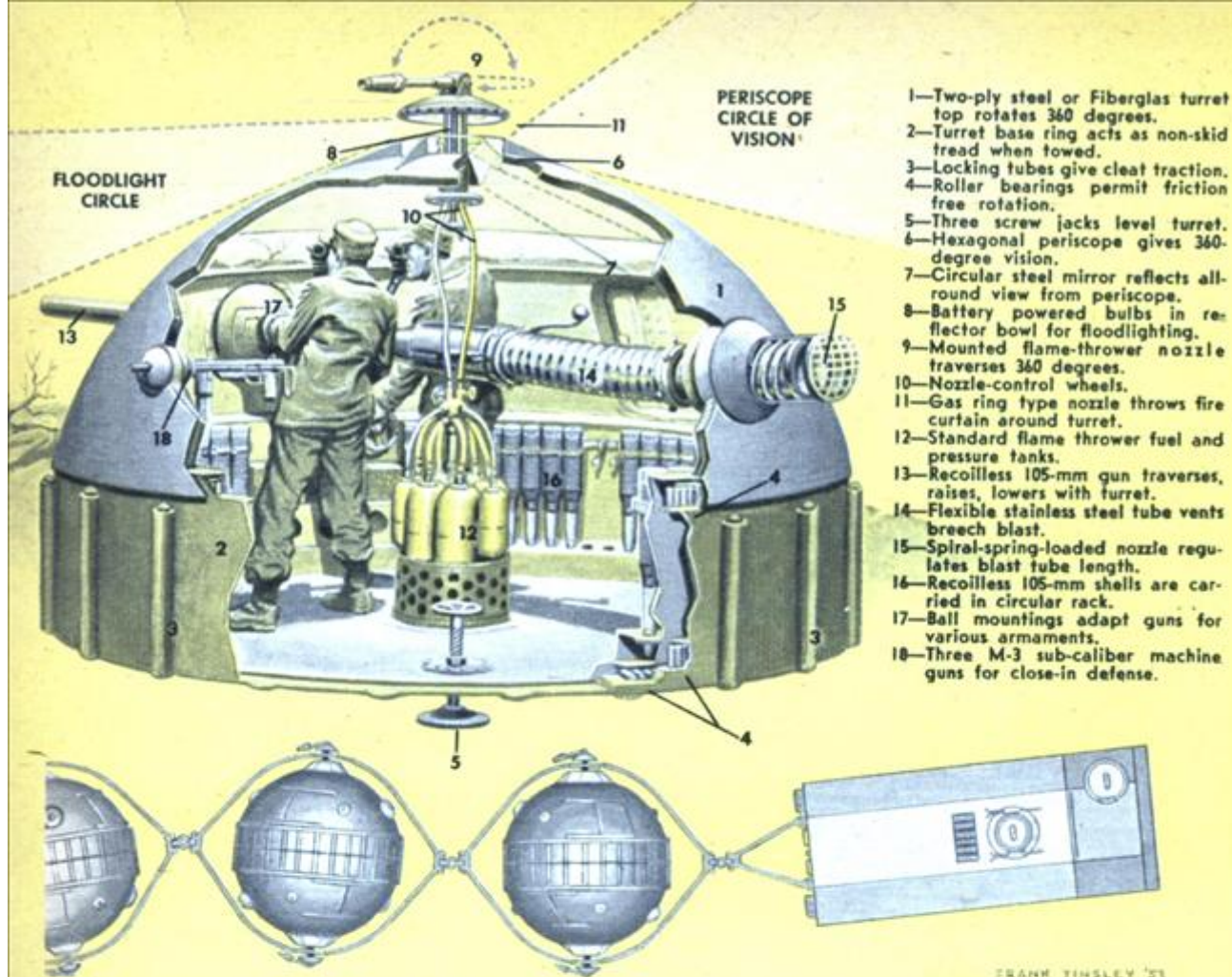


Roadable, bulletproof eggs that split apart to form armed twin turrets to protect our GI's.

By Frank Tinsley

THE new and nasty brand of infighting that bloodied the rugged ridges of Korea has hammered home some tough tactical lessons to Uncle Sam's ground forces. Mass "waves of the sea" attacks, totally new to American military experience, steamrolled over our positions despite the staggering casualties we inflicted. Stealthy, knife-wielding night raiders cut front-line morale to ribbons until our weary dogfaces learned the necessity of unceasing nocturnal vigilance. Saturation mortar shelling turned ordinary trenches and fox-holes into open graves and forced the evacuation of hard-won footholds. Key hilltops taken by day and retaken by the Reds in night attacks made front-line life an endless round of hand-to-hand hell.

While bulletproof jackets and improved helmets have helped, the



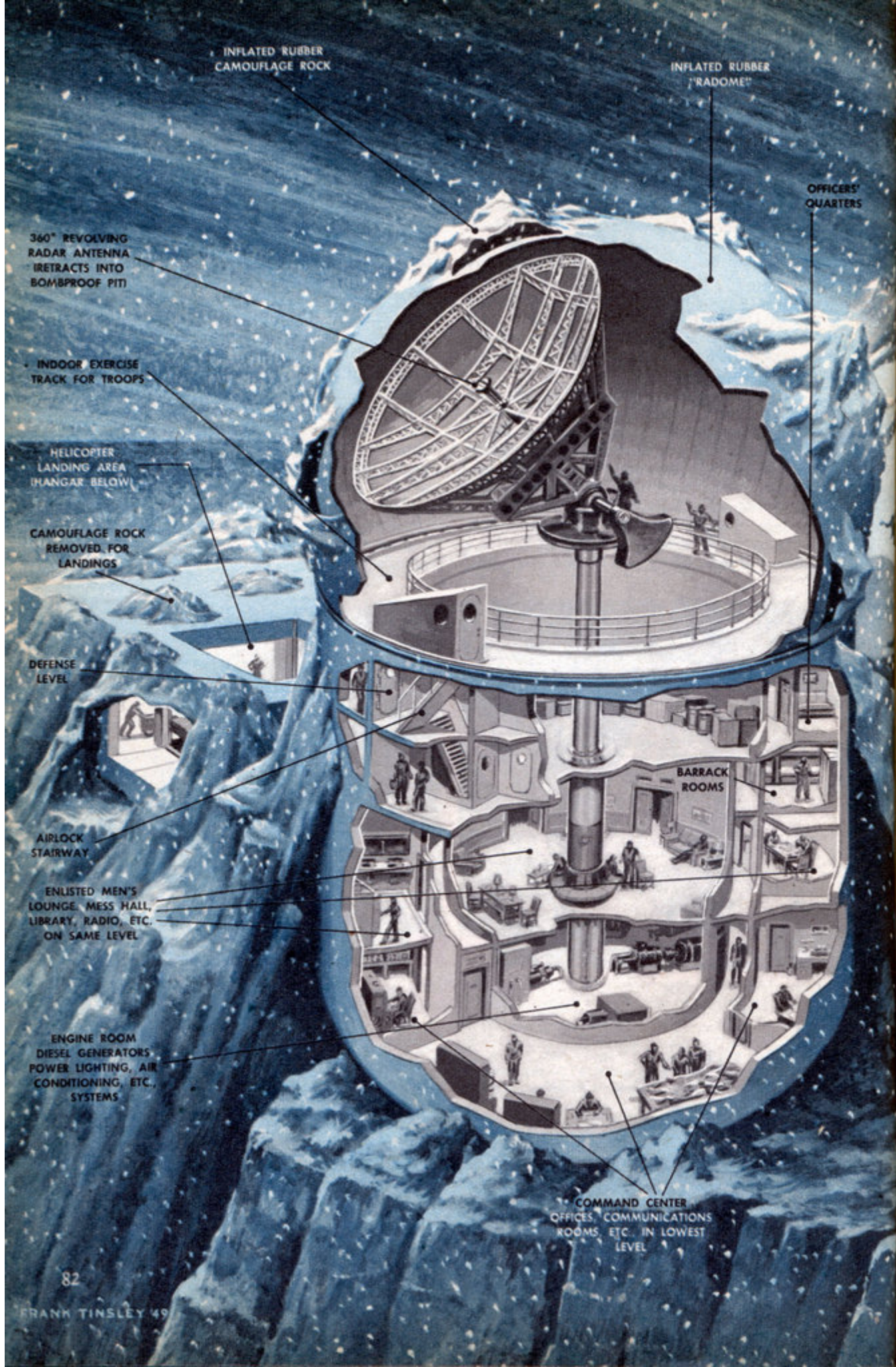
View showing pillbox turrets locked together in pairs for towing. Note the flat, ribbed tread rings and the universal couplings of the towing yokes. Prime mover shown is a T-18 armored personnel carrier.

only real answer to the steady stream of casualties was to get the men under cover. That meant burrowing like harried moles, deeper and deeper into the stony slopes. Often this protection was made impossible by solid rock or lack of time to consolidate a newly taken position. Where it was possible to dig, the treeless character of the country made the timbering of bombproof shelters a problem. A form of prefabricated bunker was finally adopted using standard-cut lumber shipped clear across the Pacific from the U. S. It was, of course, costly in dollars and a strain on our logistical system. The timbers had to be unloaded at Pusan, forwarded by rail and truck to combat bases and finally brought by Chogie bearers uphill and down to the fighting front. When eventually built at the cost of enormous physical labor, the bunkers offered fair protection against shell fire but proved far from impregnable to troop attack. They could be bombed out, gutted with automatic weapons or set afire.

Something better is obviously needed to meet the Red preponderance in assault manpower—something more in line with our American philosophy of using machines rather than muscles.

A possible solution to the problem has been advanced by Lee Elliott of Bakersfield, California, in his recently patented "Mobile Metal Turrets." (Patent No. 2,651,973.) His idea, which combines simplicity and practicability, is to couple a pair of armored domes bottom-to-bottom and, by passing an axle through their apexes, tow them on their sides behind a tank or truck. A whole series of these spherical units can thus be hauled in tandem. The domes are fitted with sliding doors and windows which are closed and locked in transit.

While Elliott's traveling shields are miles ahead of the present timber supported dug-outs, his over-simplified design would seem to impose certain tactical difficulties. Being floorless, static domes, they cannot be rotated on a fixed base and thus are im-



INFLATED RUBBER
CAMOUFLAGE ROCK

INFLATED RUBBER
"RADOME"

OFFICERS'
QUARTERS

360° REVOLVING
RADAR ANTENNA
RETRACTS INTO
BOMBPROOF PIT

INDOOR EXERCISE
TRACK FOR TROOPS

HELICOPTER
LANDING AREA
(HANGAR BELOW)

CAMOUFLAGE ROCK
REMOVED FOR
LANDINGS

DEFENSE
LEVEL

AIRLOCK
STAIRWAY

ENLISTED MEN'S
LOUNGE, MESS HALL,
LIBRARY, RADIO, ETC.,
ON SAME LEVEL

ENGINE ROOM
DIESEL GENERATORS
POWER LIGHTING, AIR
CONDITIONING, ETC.,
SYSTEMS

BARRACK
ROOMS

COMMAND CENTER
OFFICES, COMMUNICATIONS
ROOMS, ETC. IN LOWEST
LEVEL

Rubber Fortresses for A-Bomb Defense

Here's how the Air Force's new air-building can hide the radar sentries guarding America against attack.

By Frank Tinsley

CAN we avert an atomic Pearl Harbor? Yes, we can—with rubber bubbles!

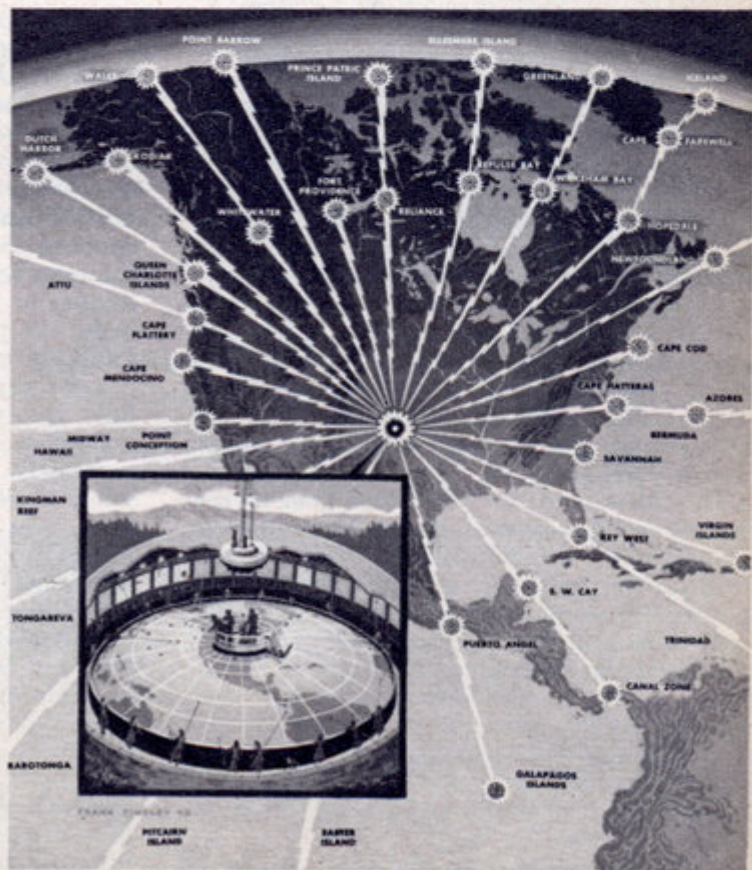
For a string of giant rubber bubbles, housing radar sentries, hidden in the icy peaks of America's northernmost mountains, could be our first line of defense against any A-bomb attack. The secret of these amazing rubber fortresses is the new Radome, a revolutionary shelter of rubber and glass textile, developed by the Cornell Aeronautical Laboratory Inc. for the Air Force research center at Red Bank, N. J.

These radar outposts could be the modern equivalent of the frontier forts of Indian days. Miles apart in practically impassable wilderness, each must be a well-hidden, self-contained fortress, capable of guarding its precious equipment securely against any sneak attack. And sudden assault is just as sure as death and taxes. For if war comes again, the blinding of an enemy's eyes will be the first step before wholesale atomic destruction!

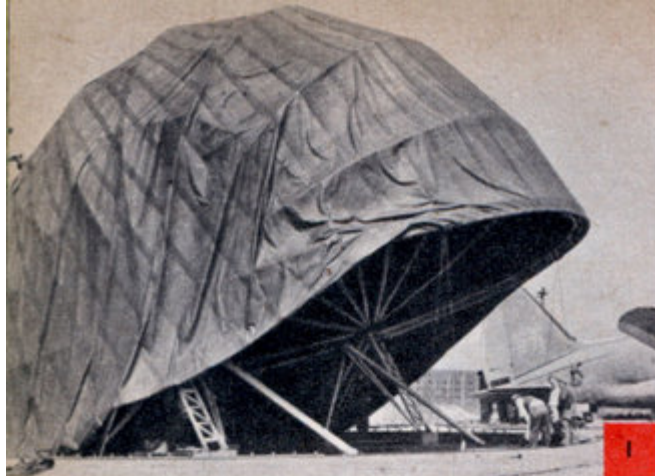
Based upon the latest military and scientific developments, here is a closeup picture of how the far-flung

radar ring depicted in the February 1949 issue of MECHANIX ILLUSTRATED can protect our country:

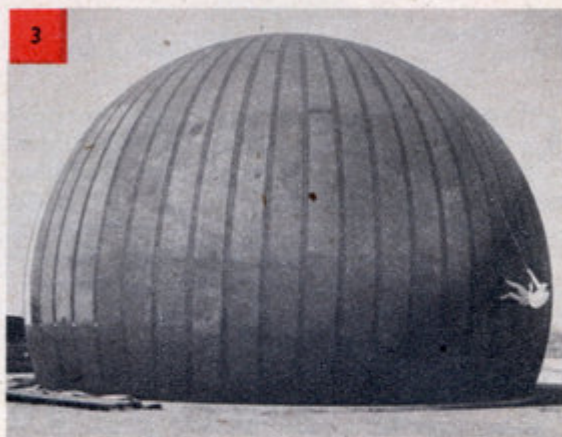
To obtain maximum radar range and permit easy defense by a minimum garrison, our rubber forts, like castles of the ancient barons along the Rhine, must roost on the most inaccessible arctic peaks. For concealment and protection against bombing, most of the installation must be buried in the rock and heavily sheathed with concrete. The parts above ground—the balloon



Key points in a vast radar ring to protect the U. S. against atomic bombing were first shown in this exclusive map of a centrally controlled warning network, pictured in the February 1949 issue of MI. On the opposite page is a cutaway closeup of a typical "rubber-bubble" unit in the proposed system.



- 1 Rubber-glass Radome is partially raised on a metal frame at Red Bank, N. J., to fit the fabric on a special cement base.
- 2 Carefully sealed to a concrete ring for anchorage, the deflated 1600-lb dome is ready to be blown up by vacuum cleaner.
- 3 Pumped up tight, the Air Force's balloon building can hold up 30 men on its cloth-thin walls and survive a 140-mph blow.



dome protecting the radar antenna and the level helicopter deck—will be well camouflaged by air-inflated rubber rocks. These will be fastened down in set patterns but can be easily removed to clear the way for flying operations.

All ground approaches to the fortress and any nearby areas that might be used for paratroop landings, will have been blasted away or neutralized by gun bunkers. The only way to reach the fortress will be by helicopter. As machine guns and flame throwers can sweep the landing platform, the chances of a successful assault by air will be nil. A 'copter ferry service will supply the garrison with both troops and provisions.

In addition to the command post in the bombproof lower level, the station will have comfortable, air-conditioned living quarters for its technical experts and guards. Unusually complete recreational facilities will help cut down the morale problems inevitable in such a confined life. A large, circular lounge, two stories high, will give the illusion of space indoors. A good library and well-equipped music, movie, television and card rooms will provide the men with plenty of entertainment during off-duty hours.

Beneath the landing platform will be a

combination hangar and gymnasium with a running track inside the base of the Radome. Athletic facilities here will permit the men to take part in vigorous sports despite the worst polar blizzards outside. Several small patrol helicopters, based at the fort, will fly hunting, fishing and mountain-climbing parties to the most favored spots in the vicinity. At frequent intervals the men will take turns going on short furloughs to Alaskan and Canadian cities in order to prevent "cabin fever" and thus keep the garrison on its toes.

Let's suppose you are a Signal Corps officer just assigned to a rubber fortress. A transport plane takes you to the most northerly air base in the area. Here, in what already looks like a virgin wilderness, you transfer to a big helicopter on the snowy apron. It is a twin-rotor job with a combination cargo and personnel carrier slung beneath its belly.

The giant eggbeater levels off at 5000 feet and heads toward a notch in the distant mountains. After hours of flying high into the cold blue yonder, the 'copter finally hovers over a rocky peak.

The craft starts windmilling slowly earthward. There's no sign of life on the bare crags. You wonder if the pilot has lost his way in this [Continued on page 154]

Can Russia Defeat Us With

Atom Bombs?

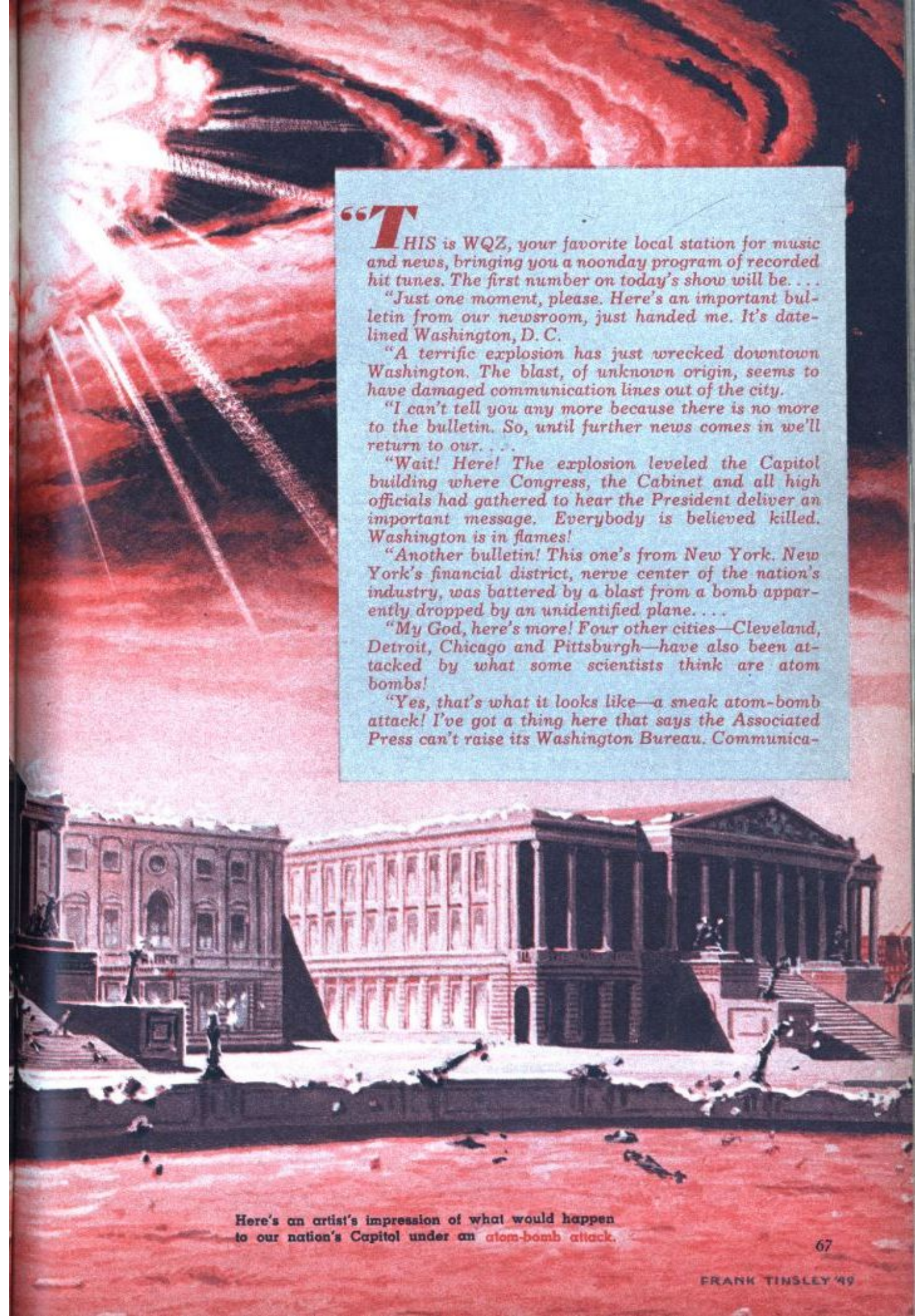


Assuming that the Reds have enough A-bombs and the planes to deliver them—could they blast us into military, social and economic chaos by a sneak bombing attack on certain key American cities?

By Ralph Coniston

turn page





THIS is WQZ, your favorite local station for music and news, bringing you a noonday program of recorded hit tunes. The first number on today's show will be . . .

"Just one moment, please. Here's an important bulletin from our newsroom, just handed me. It's datelined Washington, D. C.

"A terrific explosion has just wrecked downtown Washington. The blast, of unknown origin, seems to have damaged communication lines out of the city.

"I can't tell you any more because there is no more to the bulletin. So, until further news comes in we'll return to our . . .

"Wait! Here! The explosion leveled the Capitol building where Congress, the Cabinet and all high officials had gathered to hear the President deliver an important message. Everybody is believed killed. Washington is in flames!

"Another bulletin! This one's from New York. New York's financial district, nerve center of the nation's industry, was battered by a blast from a bomb apparently dropped by an unidentified plane. . . .

"My God, here's more! Four other cities—Cleveland, Detroit, Chicago and Pittsburgh—have also been attacked by what some scientists think are atom bombs!

"Yes, that's what it looks like—a sneak atom-bomb attack! I've got a thing here that says the Associated Press can't raise its Washington Bureau. Communica-

Here's an artist's impression of what would happen to our nation's Capitol under an atom-bomb attack.



Soviet paratroopers practice mass jumps on Siberian plains. Is it in preparation for A-day invasion?



With World War II decorations gleaming on chests, Russian pilots listen to air intent for the day.



Impulse generator, developing 500,000 amperes, is checked by its designer, Prof. I. S. Stokolnikov.

tions between that city and the rest of the country seem to be broken off.

"Bridges leading out of the city of New York are blocked by frantic mobs trying to escape. Roads are completely choked.

"Here's an eyewitness report from Cleveland. The shrieks and moans of dying people, trapped in the ruins of this once-great industrial city can be heard on every street in downtown Cleveland. . . .

"And here's a Detroit story! At this moment frightened crowds are storming auto warehouses in an hysterical effort to obtain vehicles with which to flee the city. . . .

"What? What's that? Our engineer just told me that CBS monitors have picked up a broadcast from Moscow. Stalin is telling the Russian people that an atom bomb attack has been launched against the United States! Red armies are marching against Western Europe!"

IF Americans are lucky, that broadcast will never take place except as an admittedly imaginary account. But it could be true! According to official Government reports on the effectiveness of the atomic bombs dropped on Hiroshima and Nagasaki nearly five years ago, the fictitious chain of events described by our fictitious announcer could happen here!

So-called experts deride the suggestion that Russia could, in the near future, launch a successful atomic attack against this country. We hope they are correct. But, it's difficult to forget that these same experts said Japan couldn't last more than six months in a war against the U. S. and that Russia's army would fold before the Wehrmacht. Other scientific experts also predicted that the Soviets could not possibly develop the atomic bomb before another five years. Well, look what happened!

Now, these same experts want us to believe that while Russia may have one or two bombs, she couldn't possibly have enough with which to attack us. But Dr. J. Robert Oppenheimer, one of the world's foremost atomic scientists, said that a country could produce 1000 atomic bombs in two years by an all-out effort. The Russians have been working on the atom for longer than that!

We hope the Russians are not prepared to launch an atomic war against the United States. We hope they have no intention of ever doing so. But let's play it smart this time and assume that the Reds have as many bombs as we have, and the means to deliver them to targets in America. What then?

In quest of the answer, government authorities in the field of atomic warfare were queried. Here's the picture they painted.

We dropped two atom bombs on Japan—one each on Hiroshima and Nagasaki—on August 6 and 8, 1945, causing terrific destruction. Hiroshima, a city of 343,000—about the same population as Denver or Rochester—was practically wiped off the map. The official death toll was 78,150—one out of every four persons was killed! Nagasaki, with a population of 253,000, had a fatality list with close to 40,000 names on it—equivalent to the total population of, let's say, Oshkosh, Wisconsin.

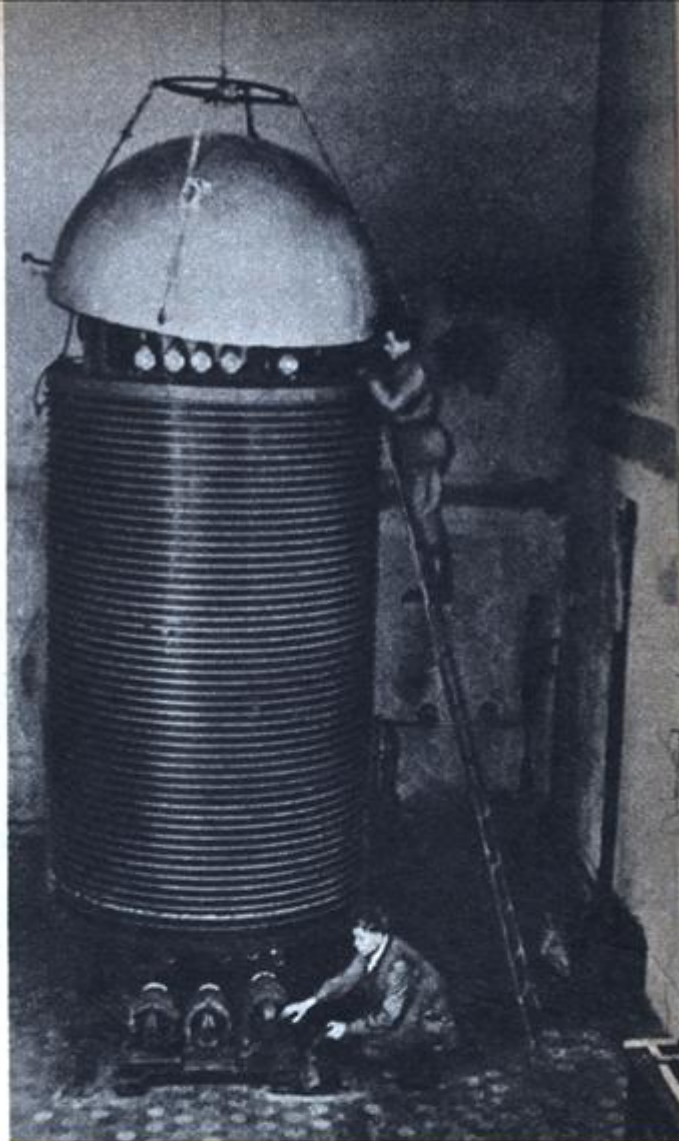
Already, the type of bombs used on these cities has been outmoded. So, just imagine how much destruction could be wrought on heavily-populated American cities by the more destructive bombs developed in the intervening five years!

What would happen if just one bomb were dropped on the Capitol building in Washington, D. C., keeping in mind that devastation elsewhere would be even greater than in this "city of magnificent distances."

Practically every building within a half-mile radius would be completely destroyed. Steel frames might be left standing but their walls would be stripped off by the mighty puff. Save in a few cases of exceptionally good construction, roofs and ceilings would collapse from the blast pressure and bury everybody inside. And remember, we're assuming that *only one bomb* would be dropped!

Within this same half-mile radius, any living creature directly exposed to the blast would be killed immediately. Contrary to common belief, most immediate deaths would not come from radio-activity but from burns. A policeman standing on the Mall, 2000 feet from the explosion near the Capitol, would be fatally burned by the immense heat radiated by the bomb during the first split second.

Some of the Congressmen at the Capitol would die of ruptured internal organs. Those not killed immediately by flash burns or blast injuries might well perish beneath falling walls or in fires breaking out from damaged wiring and broken gas lines. At Hiroshima, only 15 in 100 deaths came



Scientists assemble a 1,500,000-volt neutron generator used in atomic experiments at the U.S.S.R. Academy of Sciences in Kharkov.

from radiation sickness—the great majority might have been caused by any ordinary bombing. However, many other persons in this half-mile radius who escaped death initially, would probably die a few days later from radiation sickness.

In the area a half-mile to a mile from the explosion, most buildings would still receive major damage. The White House, much of which was built more than a century ago, would be smashed with the exception of the newly constructed East Wing.

In this area, deaths would taper off somewhat. Many of those exposed to radio-activity without shielding would become severely ill and then die. But some people would escape harm completely. The chances? About 50-50.

In the great swath a mile to a mile and a

half from the explosion, damage would taper off still more. Modern buildings would remain standing but would require extensive repairs.

Deaths would be reduced but many would perish in the fires enveloping damaged structures and from injuries received in their collapse.

Beyond a mile and a half, death and damage would continue their toll although in lessening degree. Two miles away, the well-built structures would survive although flimsy buildings would suffer heavily. Even the Pentagon Building, three miles from the Capitol, would lose many of its windows.

Four miles from the center of the blast, there'd be almost no destruction and no injuries—only a memory of a muffled groundshaking rumble.

In other target cities, the effects would be similar. Relief and rescue work would be hampered in all places by blocked

streets, broken water mains, failure of electric power and general panic. Medical supplies would be critically short, particularly unguents for burns. Hospital facilities would be completely inadequate, especially considering the fact that many units would be destroyed by the bomb itself. Remember that at Hiroshima nine-tenths of the doctors and nurses were casualties because hospitals were located in the center of town.

What would be the Russian plan of attack? Well, current *American* strategic plans are based upon the ability of the B-36 to deliver the bomb to Russian targets. The bulk and difficulties in handling the bombs would probably rule out the use of Fifth Columnists, submarines or guided missiles. So, the Russian bombs would probably be delivered by suicide bombers carrying enough gas for a one-way trip or by super-bombers which could make the return trip. Word has leaked out of Russia that a new

PRIMARY TARGETS

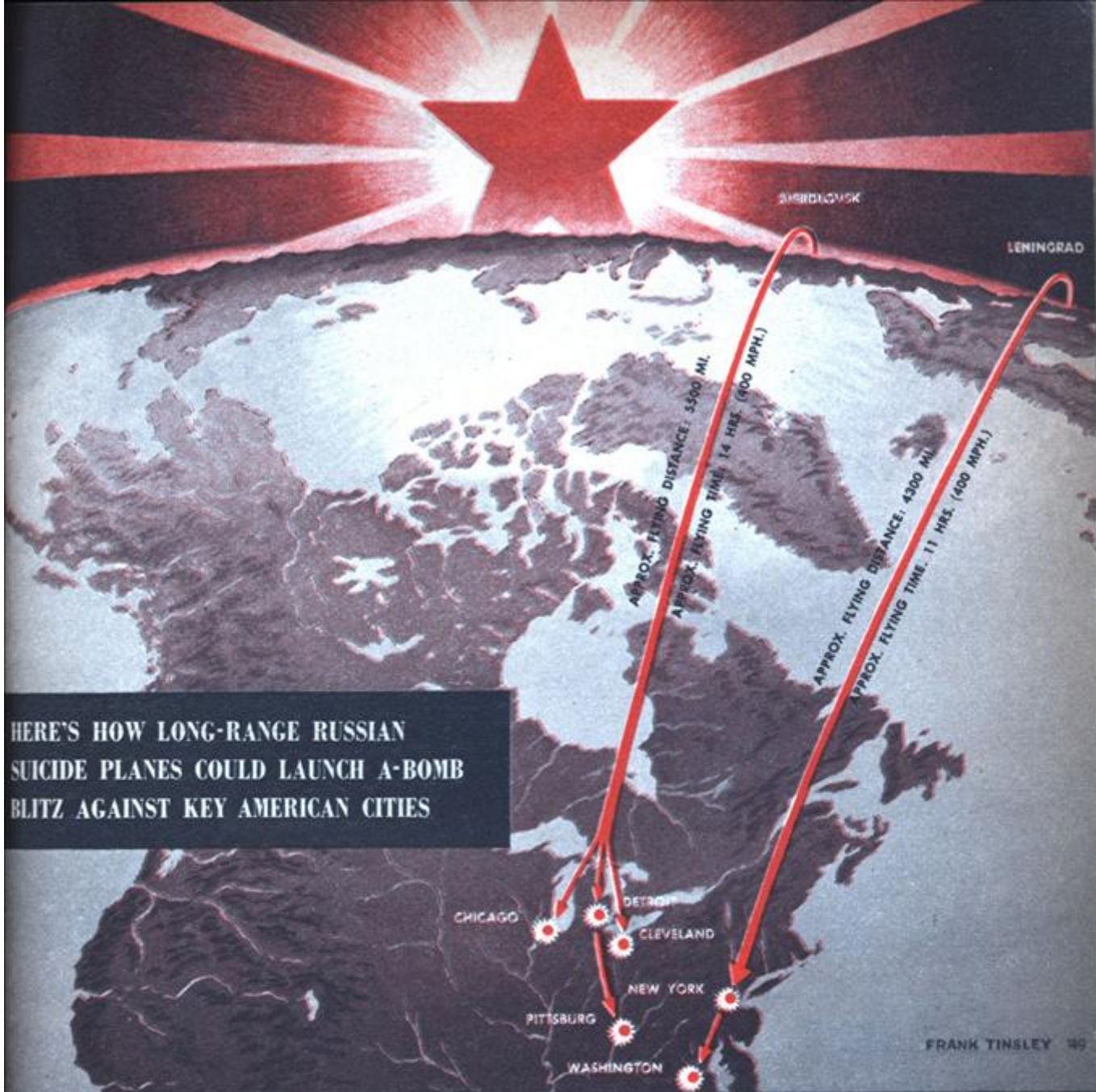
WASHINGTON—Seat of military and civilian authority.
NEW YORK—National industrial headquarters and industrial center.
CHICAGO—Industrial headquarters and production center.
DETROIT—Heavy industry making arms in war-time.
PITTSBURGH—Steel center.
CLEVELAND—Steel and other industry.
ST. LOUIS—Industry.
BOSTON—Industry.
WILMINGTON—Chemicals and explosives.
NEWARK—Electrical and chemical industries.
BUFFALO—Chemicals, metals, machine tools, engines and turbines.
PHILADELPHIA—Steel, ships, electrical equipment, railway locomotives and cars.
BALTIMORE—Airplanes, electrical equipment, metals.
COLUMBUS, OHIO—Planes, foundries, machine shops.
SCHENECTADY—World's greatest electrical equipment center.
ROCHESTER—Optical goods and other industries.
NEW HAVEN—Arms and other manufacturing.
CANTON, OHIO—Small but greatest ball-bearing production center.
SPRINGFIELD, MASS.—Arms, automotive and electrical equipment.
AKRON, OHIO—Also small, but rubber production center for nation.
HARTFORD—Airplane engines and other manufactures.
DAYTON, OHIO—Planes, instruments, and other manufactures.

OAK RIDGE, TENN.—Major production center for fissionable material.
LOS ALAMOS, N. M.—Major production center for fissionable material.
HANFORD, WASH.—Major production center for fissionable material.
? ? ? ? ? —The site of our atom bomb-stockpile.

SECONDARY TARGETS

LOS ANGELES—Important plane factories, but widely dispersed, offering poor target.
HOUSTON—Refineries and chemicals, but consequently better target for incendiary bombing. Also longer range.
BAYONNE—Refineries and consequently better incendiary target.
WICHITA—Planes and other manufactures, but small.
TRENTON—Metal working, but small.
YOUNGSTOWN, OHIO—Small steel center.
HAMMOND, GARY, INDIANA HARBOR, ETC.—Important steel production, but strung along lake presenting poor and wasteful target for atomic bombing.
TOLEDO—Industry.
SAN ANTONIO—Air training center, but dispersement and long range from Russian bases makes it poor A-bomb target.
BIRMINGHAM, ALA.—Steel, but small and at difficult range.

Our big power dams such as Bonneville and the Hoover dams, while worth-while objectives for destruction, could be knocked out as effectively and less expensively by parachuted mines, as we did in Germany.



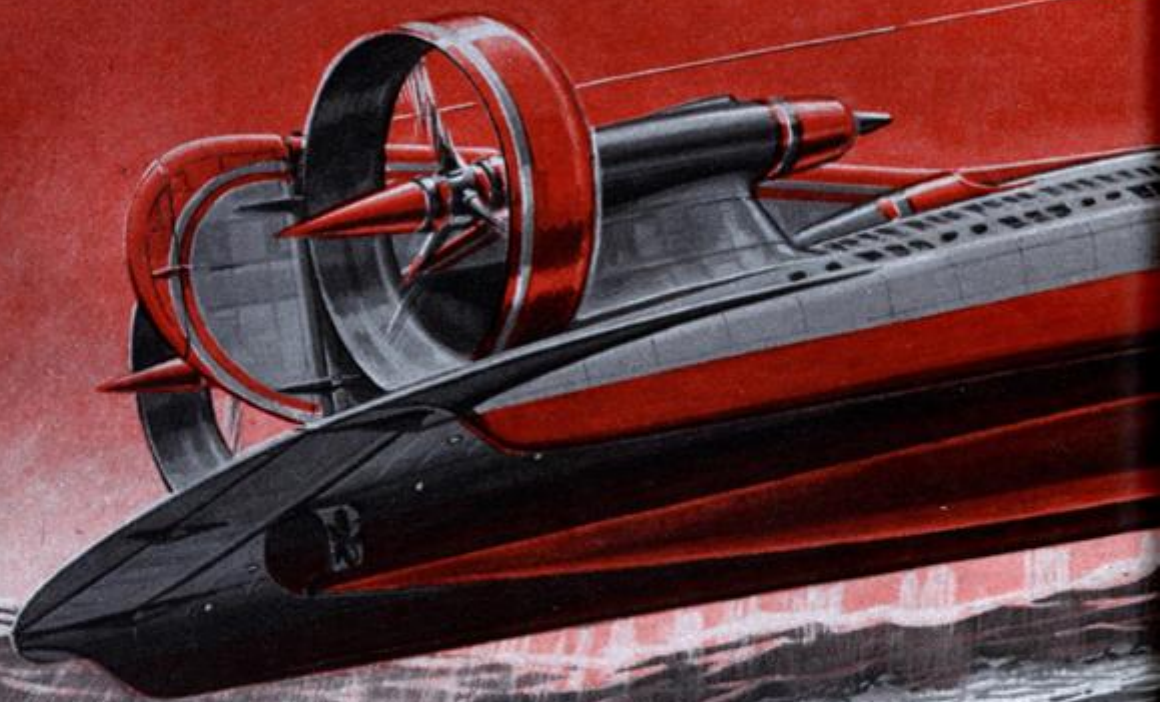
super-bomber has been produced there so that might very well be the vehicle of attack. Could they reach American target cities from their trans-Polar bases undetected? That depends upon many factors. Congress has appropriated funds for the beginnings of a protective radar net. Such a net, however, is like a chain—only as strong as its weakest link. To be completely effective, it must be all-inclusive, with stations in Canada and Mexico and on ships at sea. This is a tremendously expensive setup.

To take advantage of such a warning system we would need thousands of fighter aircraft and a well-planned system of civilian defense including specially built

shelters. These facilities do not exist at present. Planes flying over Canada now would cross thousands of miles of wilderness where the few inhabitants would have little idea of whether they were Russian bombers or Hottentot airliners. And, if the planes carried standard U. S. Air Force markings indicating that they were experimental types, even the Air Force might be fooled temporarily.

Aside from the material damage, what would be the probable outcome of such an attack? Well, first of all, the nation would be paralyzed by shock for a short while. The wounds would be so great, there would be a tremendous job to do merely in overcoming the first [Continued on page 174]

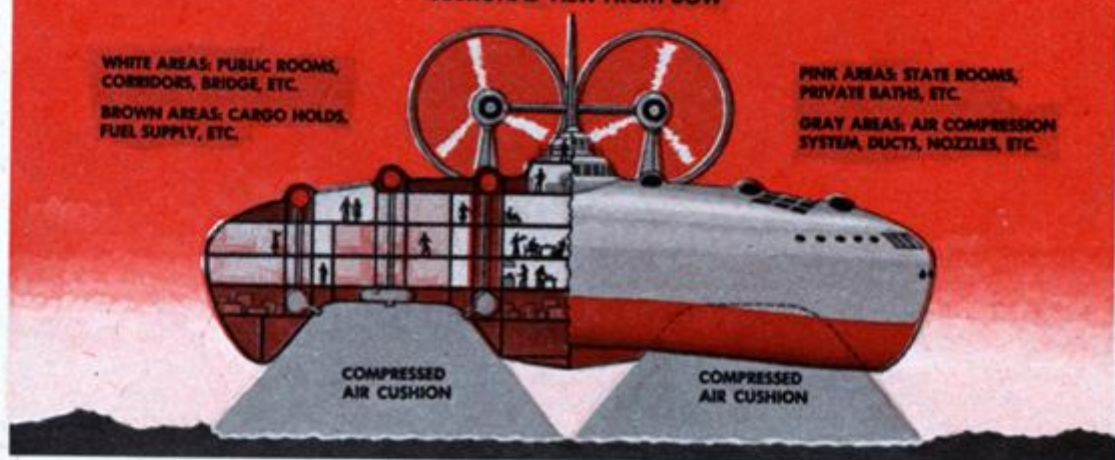
SEAGOING



SECTIONAL VIEW FROM BOW

WHITE AREAS: PUBLIC ROOMS,
CORRIDORS, BRIDGE, ETC.
BROWN AREAS: CARGO HOLDS,
FUEL SUPPLY, ETC.

PINK AREAS: STATE ROOMS,
PRIVATE BATHS, ETC.
GRAY AREAS: AIR COMPRESSION
SYSTEM, DUCTS, NOZZLES, ETC.



SAUCERS



By Frank Tinsley

THIS radical new ship is now under development by the British government. According to the London Daily Mail the Saunders-Roe Aircraft Co. is now hard at work on preliminary research.

The idea is essentially the same as that proposed for Ford's futuristic "Wheel-less Car." (See Oct. '58 MI) The MI design calls for an elongated saucer form with a horseshoe-shaped cavity underneath. Compressed air is expelled from nozzles in the top of this cavity, which contains the pressure and directs it against the sea's surface, lifting the saucer a few feet above the water. Airplane-type propellers, driven by gas turbines, propel the skimmer at high speed. In docking or lying at anchor, the pressure is gradually reduced and the ship lowers to the water. A water propeller and rudder are provided for surface maneuvering.

The British expect saucers to carry up to 1,000 passengers, hit over 100 mph. Development will probably take about ten years. •

What About Those...

SECRET WEAPONS?



FRANK
TINSLEY
50



Every war has its weird whispers about death rays, super gases and invisible submarines.

By Clive Howard

THE businessman got the word from the son of a scientist who heard it from a college professor working in nuclear research. Now it's traveling with a speed that would embarrass sound. From tongue to tongue, from ear to ear the whispers twist the story about America's newest secret weapon.

What is it? You mean you haven't heard? Well, at last report it was a combination Geiger-radar-rocket-fire control unit which detects atom-bomb bearing planes and directs robot missiles at them automatically!

Thus begins a new chapter in the fantastic history of the secret war weapon—a history that goes back almost to the beginning of time. Probably the original story about a secret weapon made the rounds shortly after a man discovered that a large rock could kill an enemy.

Any competent sociologist might have concluded that the atom bomb

Cosmic death rays, aimed from the tops of the tallest buildings, destroy enemy planes and even whole enemy cities many miles away.



Arctic death mist is supposed to freeze instantly everything and everybody it touches.

would end for all time the myth of the secret weapon. After all, nobody could possibly invent anything more fantastic. Instead, the bomb caused the reverse—people seem to reason that a civilization that could produce the atom bomb may well produce something even more spectacularly lethal.

So the post-atomic crop of mythical weapons tops everything that has gone before. For instance, in Florida in the early months of 1950, an inventor was supposed to have perfected an instrument that could produce tidal waves anywhere on earth. A scientist before a huge control board throws a switch and somewhere thousands of miles away the ocean floor is thrown into upheaval. Enormous waves begin to move shoreward. In a matter of hours the target city—perhaps even a whole country—is under water.

Then there's the arctic death mist. This is a gas, supposedly almost perfected by Nazi scientists, which can freeze solid everything it touches. Colorless and odorless, it can wipe out all the inhabitants of an entire country. The death mist neatly fits the newer concepts of war—in time it evaporates, thus allowing the enemy to capture a country and its resources intact.

In all the recorded history of the world, there has never been a war in which one side or the other did not come to believe that the enemy possessed a secret weapon far deadlier than any actually in use. In the winter of 1942, for instance, the rumor of a new German submarine spread through the United States Merchant Marine. There was ample reason to believe the story—the toll in ships and lives taken by German submarines on the Murmansk run had been tremendous.

The new submarine—so the story went—was completely invisible. Radar couldn't detect it and it couldn't be seen by the human eye even in broad daylight. But it could surface in the middle of a convoy and only a lucky, blind hit would keep it from sending every ship to the bottom.

And in England, in the winter of 1943, American and British pilots began hearing of two fantastic anti-aircraft weapons the Germans had been holding in reserve. One was a giant magnet that could suck down from any altitude whole fleets of invading aircraft. The other was an airborne flame-thrower that would roast a pilot in his cockpit.

The weapons never existed, of course. But they took a toll in fear and lowered

morale. How does the myth of a secret weapon get its start? No one can say for sure. Some just seem to grow out of thin air—especially when a nation is on the losing side of a war. Many are the deliberate plants of warring nations. Others, the kind that persist in time of peace, are of vaguely scientific origin. And some, of course, get their start in pulp magazines and comics.

In all the history of the mythical war weapon, one grimly prophetic fact emerges. Eventually, the most persistent myths nearly always become real weapons—and the real weapons are usually more lethal than the ones invented by imagination alone.

The Archimedes myths are a perfect example. In 220 B.C., the besieged city of Syracuse was a cinch to be taken by the Romans. But then word spread among the Romans of a new weapon possessed by the city and invented by Archimedes, the celebrated Greek mathematician.

It was a gigantic glass. Aimed at an invading ship when the sun was in the sky, the glass would cause its target to burst into flames. Although Archimedes had, in fact, experimented with the principle of the magnifying glass, no such weapon existed. Yet the fear of it prolonged the war by at least three years.

Some time before, Archimedes had made

an astounding statement which attracted much attention. "Give me a base somewhere off the earth," he said, "and I can control the earth. I can stop it, start it, make it turn faster, turn it in the opposite direction."

That theory was debated down through the centuries. Some scientists called it possible; others labeled it ridiculous. Then, in April of 1946, U. S. technical experts probing through Germany's secret war files, came up with a fantastic bit of news. German scientists had been working on a weapon that combined Archimedes theory with his magnifying mirror!

What they planned was a sun gun—an enormous mirror which would float just above the gravity area. The satellite would revolve with the earth but its altitude would remain fixed. The Nazi's hoped to use the satellite to focus the sun's rays on a target—a city, a military installation, an atomic-bomb production center—and burn it to a crisp.

The story of the satellite planet might have died right there but for a few lines of type which kept the rumors alive. They appeared buried in the first annual report of the national military establishment made public by the late James Forrestal in December 1948. The lines read: "The earth satellite vehicle [*Continued on page 175*]

Vertical flamethrower for destroying low-flying planes was widespread rumor before invented.

One of World War II's most closely guarded secrets was England's blazing-oil coastal defense set-up.



Secret Weapons

[Continued from page 67]

program, which is being carried out independently by each branch of the military service, was assigned to the committee on guided missiles for coordination."

The common insect has been one of the most persistent of the mythical weapons. When bubonic plague reduced London to a city of corpses and weary gravediggers, many believed an enemy had sneaked thousands of infected rats into the city. In both world wars, stories of bug weapons were as numerous as stories of upcoming furloughs. And they persist even between wars. When the dread hoof-and-mouth disease broke out among cattle in Mexico in the summer of 1946, many believed it was the work of saboteurs. The disease, according to the belief, had been implanted by enemy agents so it would spread across the border and decimate our entire beef supply. In the fall of 1949, Russia was said to have invented a new and quickly fatal disease which could be implanted in bugs and transmitted to humans. And in the spring of 1950, when East German potato crops failed, Russia blamed the whole thing on the United States. The real cause, according to Radio Moscow, was a beetle dumped on the crops by American airplanes. In North Korea, in the fall of last year, American troops stumbled into a macabre laboratory. It contained hundreds of diseased rats and equipment that indicated the laboratory had been engaged in implanting disease germs in small animals.

Almost at the same time, in a public statement which has never been refuted, Rear Admiral Ellis M. Zacharias said, "Our American germ weapons are already superior to our atomic weapons." Remember that this statement was made 300 years after the myth of bacteriological warfare had spread through plague-stricken London!

In these jittery days, Russia comes in for her share of secret-weapon speculation, too. Recently a rumor was making the rounds about the Russian scientists who are supposed to have tested a new weapon that would make the atomic bomb obsolete.

The instrument is a cosmic ray gun. Red scientists, according to the story, succeeded in harnessing the same deadly rays given off by the sun but until now rendered harmless to man by distance and atmospheric interference.

There are at least two versions of how the ray will be used. One story says Russian soldiers will carry lightweight cosmic ray guns which resemble flamethrowers. Airplanes will be equipped with giant guns that sweep the beam over a wide area—killing everything.

[Continued on next page]



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Secret Weapons

[Continued from page 175]

The other version is a gigantic instrument nearly the size of the tallest skyscraper. Set up along Russia's borders, such guns would aim the ray at cities thousands of miles away, killing all the inhabitants in a matter of seconds.

But perhaps the most puzzling of all modern-day secret-weapon myths is the mystery of the flying saucers. First they were thought to be Russian machines, then vehicles from another planet. Now, another belief is taking hold and spectacular rumors are rife about them again.

The latest whisper found a spot in a New York gossip column in which the author stated definitely that the Air Force will release an official explanation of the flying saucers early in the summer of 1951.

Another rumor? The start of another myth? Perhaps. But, nevertheless, when June rolls around thousands of people—including you—will be waiting expectantly. •

The '51 Plymouth

[Continued from page 173]

prove visibility and comfort over many other makes of car. It steers well and holds the road nicely, though for fast going I prefer the short 111-inch wheelbase model to the 118-inch deluxe job I drove in this particular test.

My acceleration runs were not exciting. Zero to 60 took 17.1 seconds. This is a car with staying power, not flash performance. The big surprise came when I made a speedometer check. At 60 mph on the clock, the car was actually traveling exactly 60 mph. This car had the most accurate speedometer I have checked in over two years.

In summing up, this 1951 Plymouth is one of the very best buys in the country today. Chrysler products have always been top flight and this one is no exception. It is a family car that will last for years with care. It is comfortable way beyond its price and in a race from coast to coast, the Plymouth would give any car made in America a bad time even though it isn't any ball of fire when hot-rodding from a traffic light.

The old Plymouth Schooner hood ornament has also undergone a change on this new model. It's still a schooner, I suppose I'll have to admit, but it now looks like a surrealist creation kidnapped from the museum of modern art. I suspect it's really a schooner, all right, but I sure would hate to be taking any substantial bets on it. •

Fortress on a Skyhook

The U. S. is working on plans for a satellite base, Defense Secretary Forrestal reveals. Take a long look at this man-made moon—and learn how it may rule the world.

By Frank Tinsley



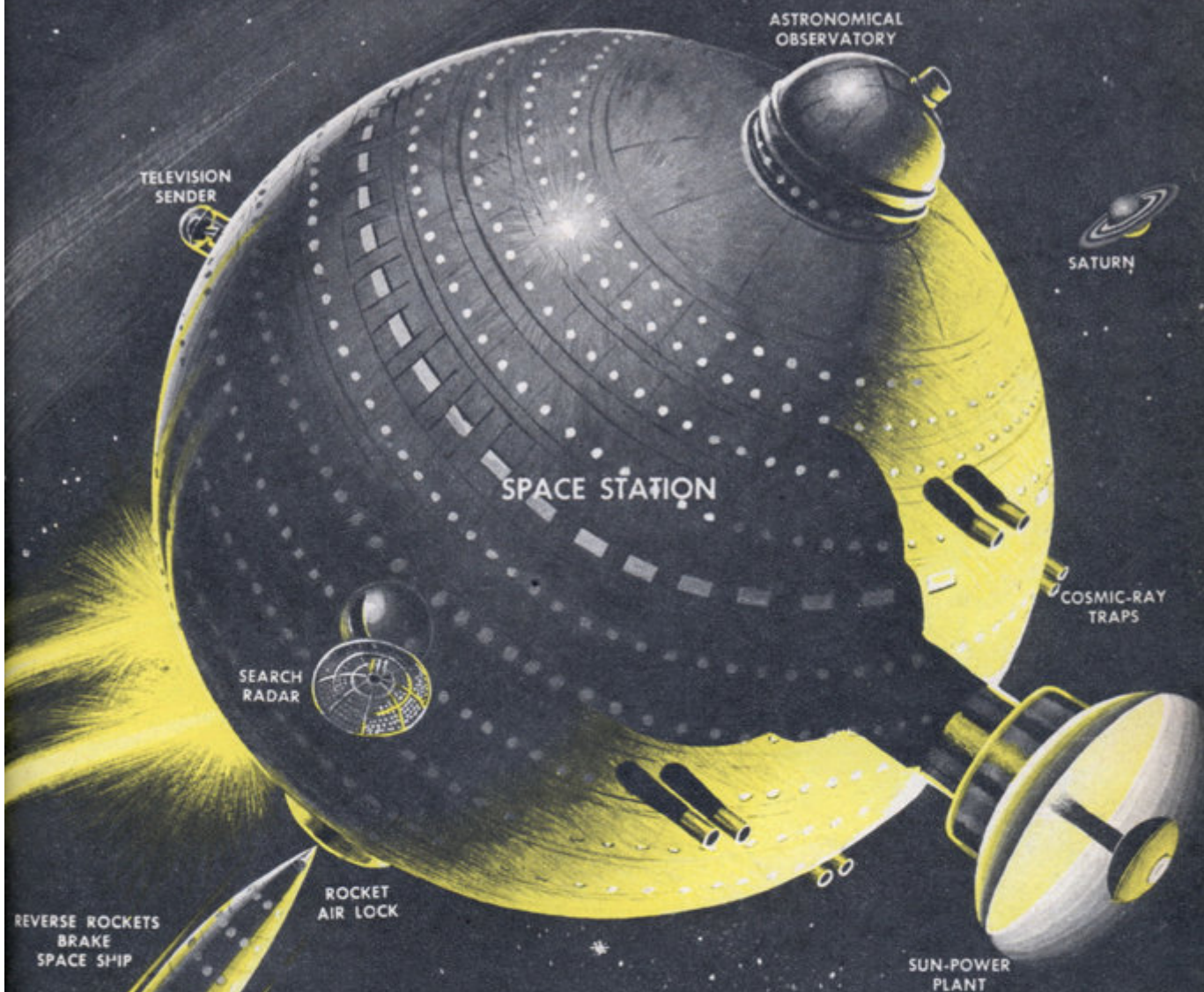
GUIDED-MISSILE ATTACK
ON EARTH TARGET

ROCKET
CIRCLES
EARTH

EARTH

ROCKET
TAKEOFF

ROCKET SHUTS
OFF POWER

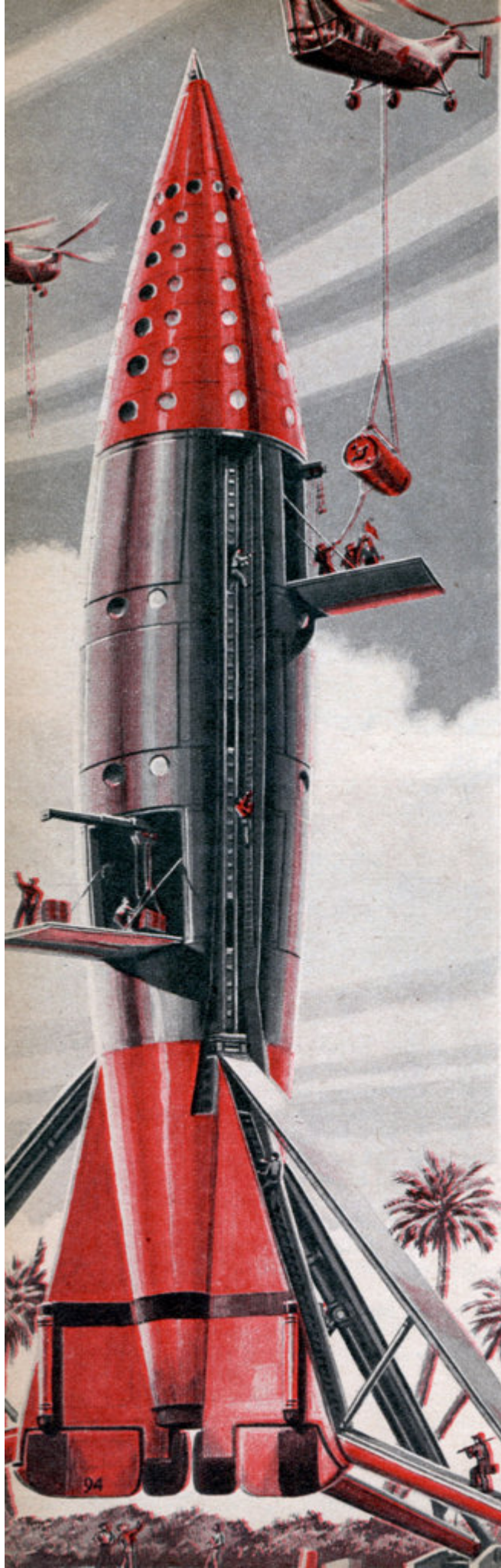


EVEN Jules Verne would be amazed at the latest activities of the U. S. Department of Defense. Secretary James Forrestal disclosed recently that his department is working on a "satellite base" to revolve around the world like a miniature moon, as a military outpost in space.

"The earth-satellite vehicle program, which is being carried out independently by each military service, was assigned to the committee on guided missiles for co-ordination," he revealed in his first annual report on the national military establishment. "To provide an integrated program with resultant elimination of duplication, the committee recommended that current efforts in this field be limited to studies and component designs. Well defined areas of research have been allocated to each of the three military departments."

There is considerable speculation as to just how far this program is meant to go. An earth satellite may be almost anything. It can range from a tiny bit of matter, projected into space for astronomical observation, to a permanent fortress on a skyhook.

We have already tried to hurl metal slugs into space. Last year at White Sands Proving Grounds, New Mexico, a V-2 rocket began firing



these little man-made meteorites at 10-second intervals after reaching an altitude of 120,000 feet. The rocket zoomed up 111 miles above the earth and technical experts hoped that some of the slugs would escape the earth's gravity so that they could be studied as tiny satellites. From all reports, this space experiment was a failure.

No one but the scientists and the top brass know the exact nature of the next effort. It may be a preliminary, unmanned rocket, equipped with automatic instruments and a radio telemetering device for sending their data back to earth.

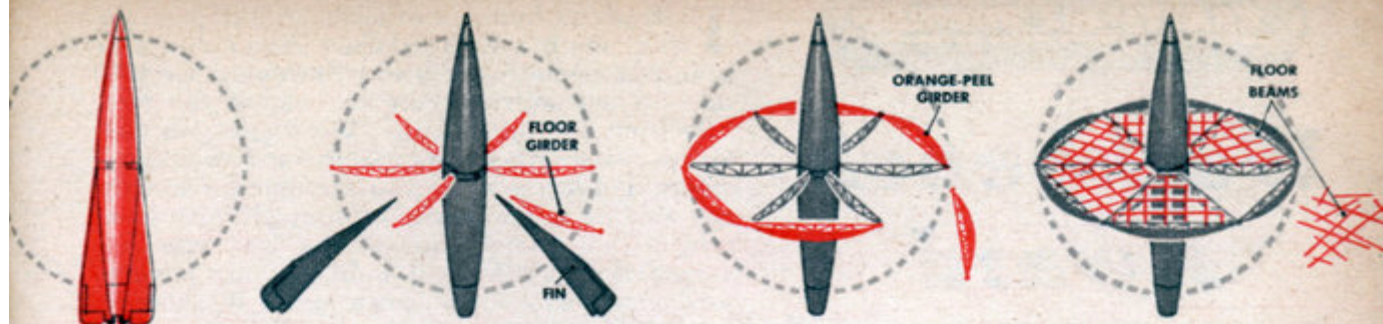
On the other hand, rocket development may have advanced far enough for us actually to build a small space ship. Such a rocket could carry several scientists on a limited observation flight around the globe, then return to base before exhausting its air supply.

Finally, with experience gained from this trial flight into space, we could plan a bigger ship that would transport the first prefabricated units for assembling a base in the sky.

During World War II, the Nazis toyed with the idea of setting up a mirror platform in space to beam the concentrated rays of the sun in a deadly "sun-gun." The first official hint that the U. S. was considering plans for its own secret weapon in space came to light in April, 1946. General Curtis E. LeMay had a cryptic item buried in an announcement then of his research program. A brief passage in this report called for development of "flight and survival equipment for use above the atmosphere, including space vehicles, space bases and devices for use therein."

With the rapid progress of scientific research in the past few years, we have seen the birth of atomic power and the phenomenal growth of aviation engines from wind-milling motors to mighty rockets streaking a plane like the Bell X-1 at a supersonic speed of 1700 mph. Unmanned rockets, like the Navy's new Neptune, are nearly ready to outstrip the Nazis' sensational V-2 and nudge the 250-mile mark.

Helicopters hover around this rocket ship to load provisions before it zooms off to the satellite base. Note foldaway landing gear and access ladders built into the leg wells of this tender, designed for shuttle service. To avoid contaminating the earth, rockets on the fins are used for takeoffs and landings. The atom jet is switched on only for travel in space.

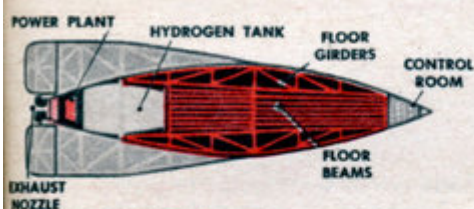


1. First rocket arrives at the site for the base.

2. Fins drop off and floor girders pop out.

3. Orange-peel girders form rim for main floor.

4. Hollow beams form a grillwork for flooring.



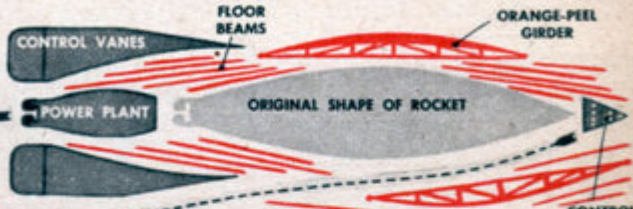
PLAN VIEW

Labels on the diagrams above show key elements in a "material" ship. Atomic pile heats hydrogen in jet.

CROSS SECTION



FRANKTINSLEY '49



EXPLODED VIEW

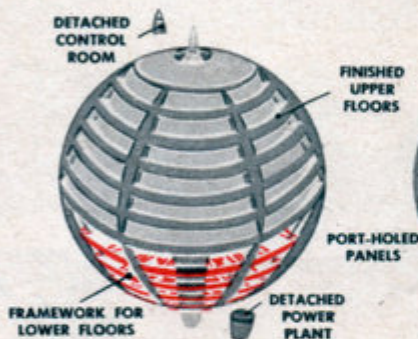
After a ship has been broken down for building the base, control and power units form a utility craft.



5. A second ship brings more girders and floor.



6. Third ship completes the primary structure.



7. Rocket 4 adds floors and interior equipment.



8. Fifth ship adds skin, sun plant, observatory.

That will put today's rockets already well out of the earth's atmosphere and almost half way to space-station altitude.

The atomic power plant is about to solve many of the problems of space travel. The virtually unlimited power of the atom engine will enable the rocket to pick up speed gradually. Atomic energy's almost infinite duration contrasts with the prodigious fuel load a chemical rocket would need merely to escape the earth's gravity. Such a rocket would require a fuel tank as big as an oceanliner to flash it out of the world at the minimum theoretical speed of 5 miles a second. In short, the atomic engine's virtues make it almost ideal for a space ship.

Almost, for there are some disadvantages too—such as radiation shielding and the dissipation of the enormous excess heat

generated by the reactor. That heat hits the incredible figure of 600 billion degrees!

These problems are being tackled one by one. Atom experts are developing light, composite shields, which reflect neutrons with one material and absorb the deadly gamma rays with another. With some of the best brains in the country on the job, even that terrific heat and the bugs common to all new mechanisms and processes soon will be conquered.

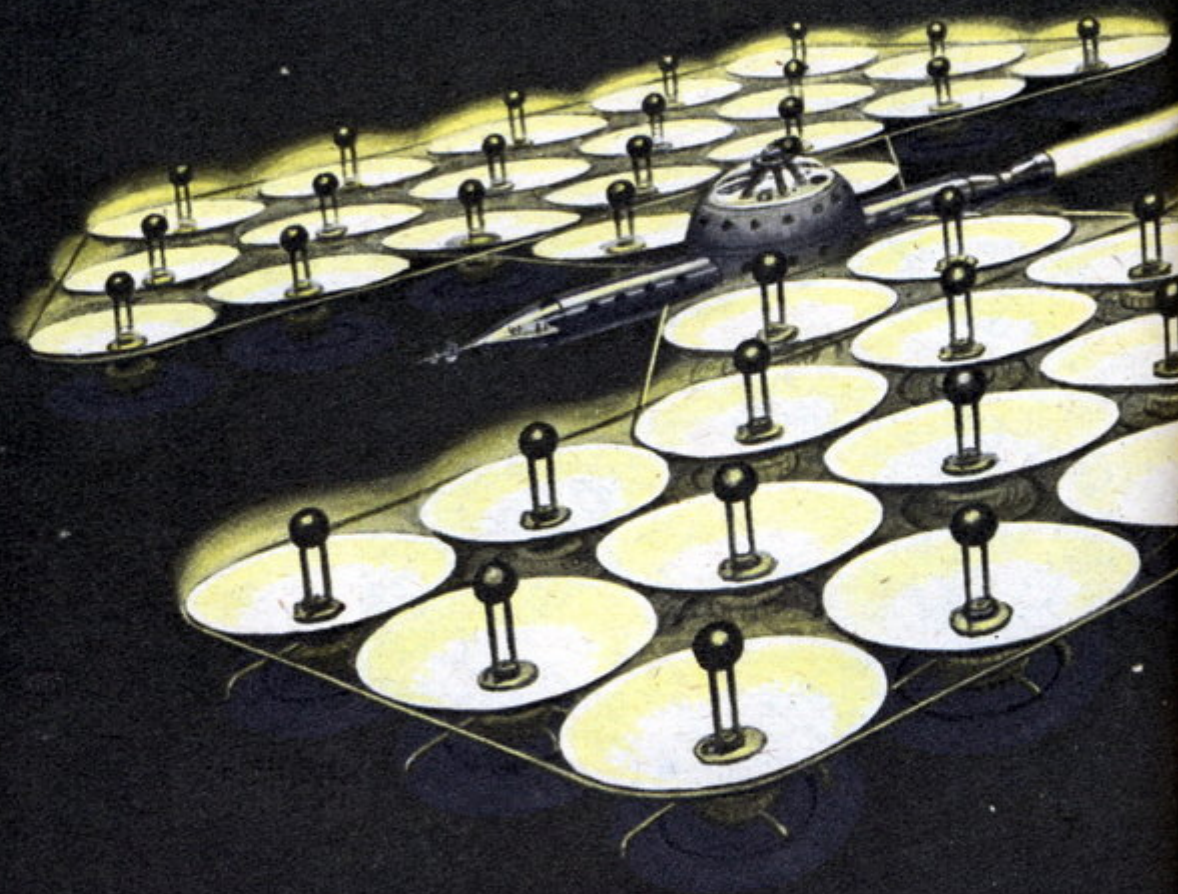
Of course, in the coming space ship the atomic reactor will merely replace chemical fuel in providing heat for gas expansion. At super-atmospheric altitudes, where air is absent, some other working gas must be expanded and ejected through the jet nozzle to produce thrust. This gas will have to be carried in tanks.

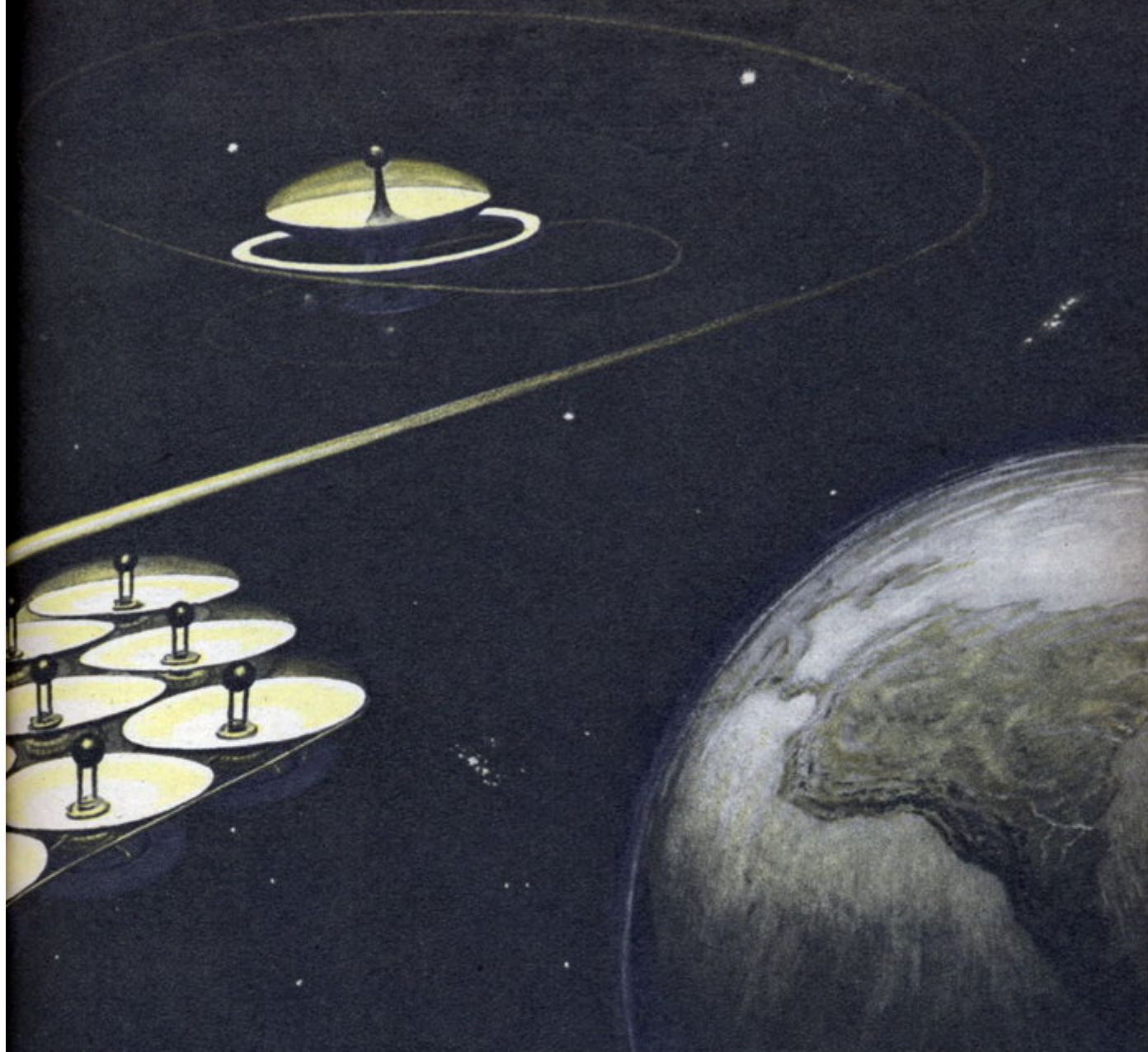
At the moment, [Continued on page 165]

FLIGHT TO THE STARS ON SUN POWER

*Designed for travel from earth satellite to the
far reaches of outer space, this amazing "solar
butterfly" uses an electrical jet exhaust.*

By Frank Tinsley





PRESIDENT EISENHOWER'S recent announcement of a federally-sponsored earth satellite project tears aside the curtain of secrecy that has long veiled our space travel research. To be launched sometime in 1957-58, Ike's "cosmic basketball" will rocket to an orbit some two or three hundred miles above the earth's surface and there circle the globe every 90 minutes at a speed of 18,000 mph. This tiny artificial

moon, about two feet in diameter and weighing around 100 pounds, is the first of our space targets for tomorrow.

Known as the Minimum Orbital Unmanned Satellite Of The Earth and irreverently nicknamed the Space Mouse, this first toddler into outer darkness will telemeter its findings to earthbound laboratories until gradually decreasing speed drops it to destruction. The Mouse's 50-pound payload in-

The power plant is made up of 40 solar power units mounted in two groups on either side of the space ship's body, like the wings of a gigantic butterfly.

cludes Geiger, cosmic ray and aurora particle counters, a magnetometer to measure accurately the earth's magnetic field, and other types of recording instruments. Electric power will come from solar batteries and a small radar beacon will permit easy tracking. Despite a relatively short life—a few days or weeks depending on its starting altitude—the Mouse will more than pay for itself in upper atmospheric data now unavailable.

The second, more ambitious step of the program, is a larger, man-carrying space station in which a crew of adventurous scientists will make their observations directly. Unimpeded by atmospheric blur, their telescopes should bring us a vastly clearer picture of the universe, and their other instruments a more accurate idea of the conditions and limitations of space travel.

The third stride envisaged by the plan will take us to our great satellite, the moon. Here, scientific colonies can prepare our space pioneers for further discoveries and provide bases where planetary spaceships can be built and launched. Equipped with these out-of-this-world craft, man will then be ready for the final leap of the series—the exploration of Mars, Venus and our other neighbors of the solar system.

In anticipation of these four primary steps, many ingenious spaceship designs have been conceived by forward-looking aeronautical engineers—and duly reported to MI readers. Latest of these is the proposal of Dr. Ernst Stuhlinger, ex-German rocket scientist who currently heads the Missile Section at our great Redstone Research Arsenal. The design is based upon a thorough knowledge of the physics of space flight and presently possible power plants. The Doctor is convinced that due to the enormous amounts of fuel required to break through the earth's gravitational grip, interplanetary spaceships must be built on and launched from a gravity-free earth satellite.

At this point, however, Stuhlinger parts company with the proponents of rocket propulsion. If conventional rocket engines are used, he claims, 170 pounds of fuel would have to be ferried

to the satellite for every pound of the ship's payload—and each of the 170 would require 1,000 pounds of ferry fuel to lift it through the earth's gravity. The staggering cost and difficulty of such a project is apparent.

The Doctor considers it obvious, therefore, that chemical rocket propulsion is out for interplanetary flights, even though it is technically possible. As a suggested solution, he would accelerate the particles that compose the exhaust stream by means of a powerful electric field, thus by-passing the temperature problem. The idea, he is careful to point out, is not original with him. It has been advanced by other space sharps and was described in the Feb. '54 issue of MI.

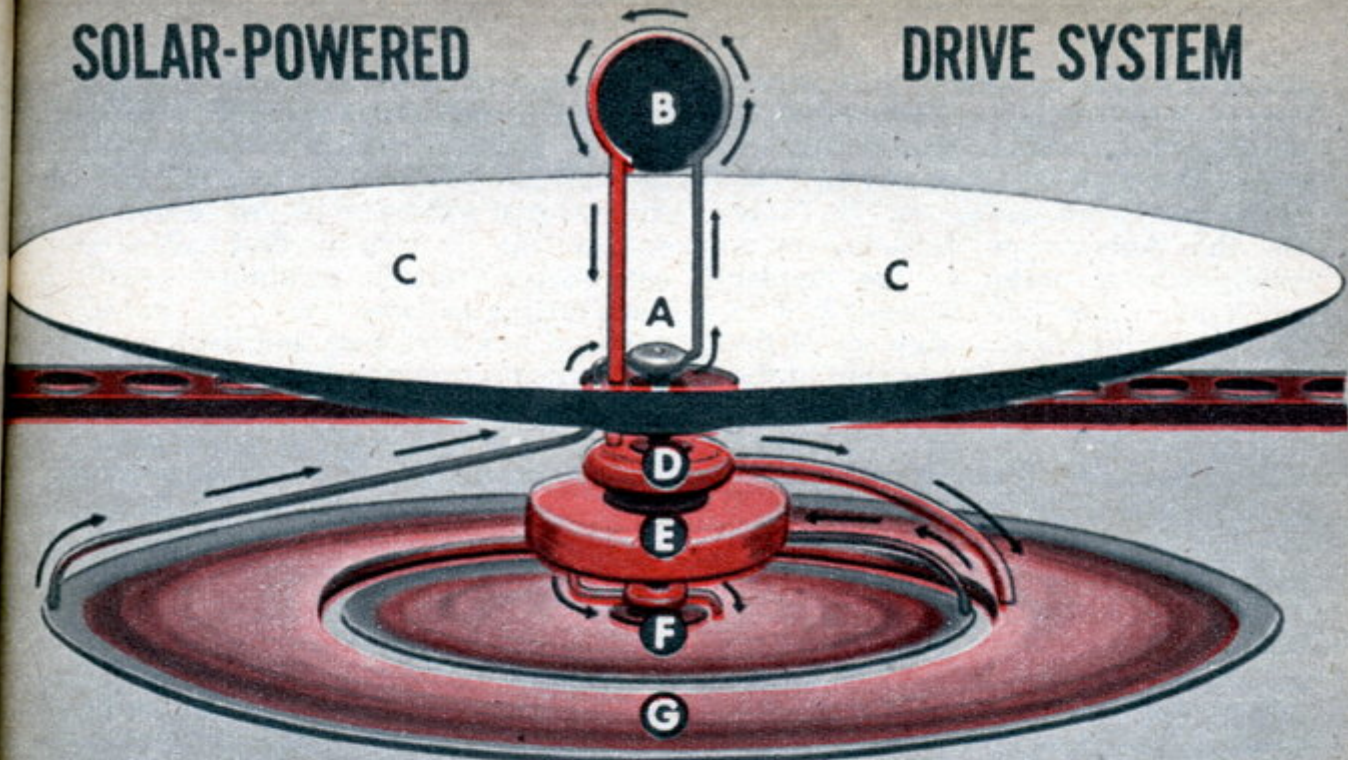
In Stuhlinger's version Cesium or Rubidium vapor replaces chemical fuel. Introduced into a ceramic propulsion chamber, the Cs or Rb atoms strike a grid of incandescent platinum plates. The platinum absorbs their outermost electrons leaving positively charged ions which pass through the grid into a thrust chamber. Here, the ion stream is accelerated to extremely high velocities by negatively charged electrodes around the chamber's real nozzle and is discharged in the form of an electrical jet exhaust.

To prevent the spaceship from building up a negative charge from the split-off electrons, these must be ejected simultaneously and at the same rate as the ions through supplementary electron thrust chambers that surround the ion nozzles in a trough arrangement. Unless the ions' accumulated charge is neutralized immediately upon leaving the thrust chamber, it will tend to repel following ions in the discharge stream and slow down jet velocity. This is the "space charge effect" familiar to designers of electron tubes. To counter it, the separate streams of ions and electrons are combined about an inch outside their thrust nozzles, thus cancelling out the objectionable charge.

To run his electrostatic plant, Dr. Stuhlinger's design requires 7,000-8,000 kilowatts of power. After considerable study, he rejected all the conventional power sources, including the atomic

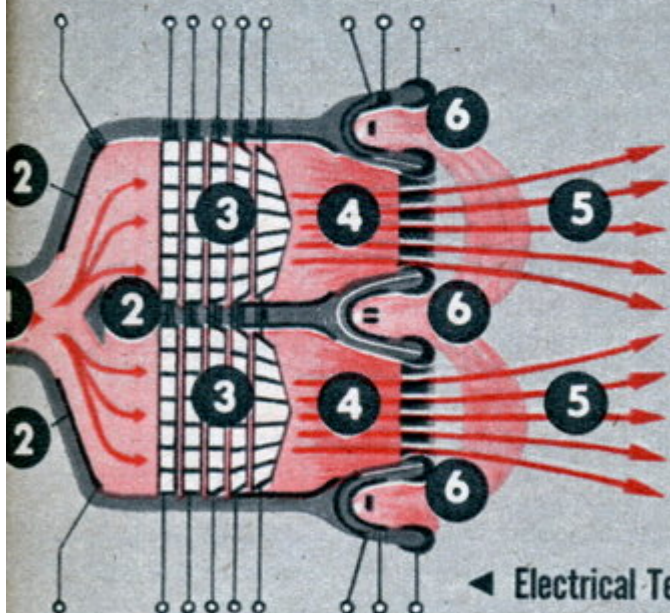
SOLAR-POWERED

DRIVE SYSTEM

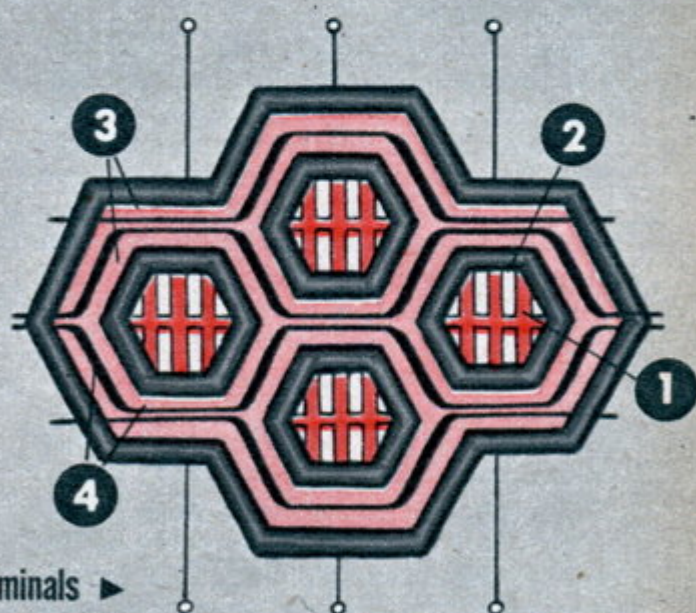


In Dr. Ernst Stuhlinger's rocketless space ship design the sun power steam plant generates electricity for the space ship's propulsive and auxiliary power systems. Center units revolve to diffuse coolants to the outer rims of the coils by centrifugal action. Heat disperses in deep cold of space.

KEY
Water pump (A) supplies boiler (B) which is heated by reflector (C). Steam turbine (D) drives electric generator (E). (F): generator cooling coil. Condenser coil (G) cools used steam to water which is used over and over in boiler system.



◀ Electrical Terminals ▶



Schematic profile of propulsion unit, which creates ship's electrical jet exhaust steam. Cesium vapor (1) enters ceramic housing. (2): Cs atoms strike grid of incandescent platinum plates (3) which absorbs outermost electrons, leaving positive ions (4). Ions are electrically accelerated and discharged in high velocity jet stream (5). Electrons (6) are arced through ions to keep negative charge from repelling ions, slowing jet velocity.

Plan view of a cluster of four propulsion chambers. A thousand such two-inch chambers, clustered in a honeycomb arrangement and powered with solar-generated electricity, provide the space ship's propulsive thrust. (1) Ion stream. (2) Platinum grid. (3) Interconnected electron projecting chambers. (4) Electric power filaments. Electrical jet exhaust propels ship just as gas exhaust from conventional reaction engine does in jet aircraft.

pile, as being far too heavy. Sun power seemed a better bet. Approximately one kilowatt of radiant energy falls on each square meter of space and the Doctor decided to put this to use. He could use the Abbott-type reflector/steam boiler/turbo-generator, or the simpler and lighter solar battery described in MI. Since the present efficiency of the battery is only about 10 per cent of the turbo-generator's he settled on an Abbott-type apparatus.

After balancing the pros and cons of power versus weight Stuhlinger arrived at what he now regards as the best power plant available.

Stuhlinger's power plant is made up of 40 solar power units, mounted in two groups on either side of the spaceship's body, like the wings of a gigantic butterfly. Each is self-contained and can function independently in case a small meteor strikes one of its neighbors. The solar unit consists of a parabolic mirror, 50 feet in diameter, which concentrates the sun's heat on a boiler set at its focal center. Steam thus developed, turns a turbine which is geared to a 200-kilowatt generator.

Two disc-shaped heat diffusers, mounted at the bottom of the assembly in the shadow of the mirror, cool the generator and condense the used steam from the turbine. The entire power package revolves around a common axis, developing sufficient centrifugal force to trickle the steam and coolant slowly toward the outer rims of the discs. On the way they transfer their heat to cold outer space and the steam reverts to water. From the rims, both are pumped back into closed plumbing systems and used over and over again.

The electric power thus obtained is carried to a propulsion assembly at the rear of the spaceship body. Approximately 1,000 hexagonal shaped propulsion chambers are used, each measuring two inches across. These are clustered together in a honeycomb arrangement to obtain the total thrust needed. This is comparatively low—on the order of one ten-thousandth of the force of gravity.

In the sterile vacuum of space, however, the sunship will be weightless and

frictional drag non-existent, so even the tiniest push can move a mountain's bulk. Unlike rockets, which would coast through most of their voyage, the sunship's thrust will be employed throughout the trip. During the first half, it is used to accelerate to maximum speed. Then, at the halfway point, the ship is reversed in a 180° turn and the thrust, acting in the opposite direction, gradually brakes her to a halt.

Stuhlinger's spaceship design, capable of carrying ten passengers plus 50 tons of cargo, weighs only 250 tons—as compared with 1,100 tons for a rocket vessel of similar capacity. Flight time from an earth satellite to one orbiting around Mars would be approximately one year. Even more remarkable savings would result on longer journeys, according to the doctor's computations. On a two-year flight of some 780,000,000 miles, the sunship would have a takeoff weight of only 275 tons, whereas the rocket job would tip the scales at no less than 7,500. Furthermore, the rocket fuel would have to be laboriously trucked up to the standing satellite at enormous cost. The sunship's fuel, on the other hand, would be free solar energy picked up as she goes along.

Interested mainly in the problems of power and propulsion, Dr. Stuhlinger makes little mention of crew accommodations. Living quarters would, of course, have to be pressurized, air-conditioned and designed to permit ten people to live comfortably together for a year or more. Individual cabins would be advisable for privacy and large lounging, eating and cooking compartments essential. Other requirements are a library, entertainment center with a good stock of movies, records, etc., an observatory, laboratory and workshop for general repairs. Oxygen would probably be generated by growing water plants in an aquarium and fresh vegetables could be cultivated in soilless chemical vats.

All this indicates a sizable sphere as the most efficient form. It would be armored against cosmic dust, well insulated and divided into decks with the public rooms at mid-level. Long tubular fuselages, projecting fore and aft

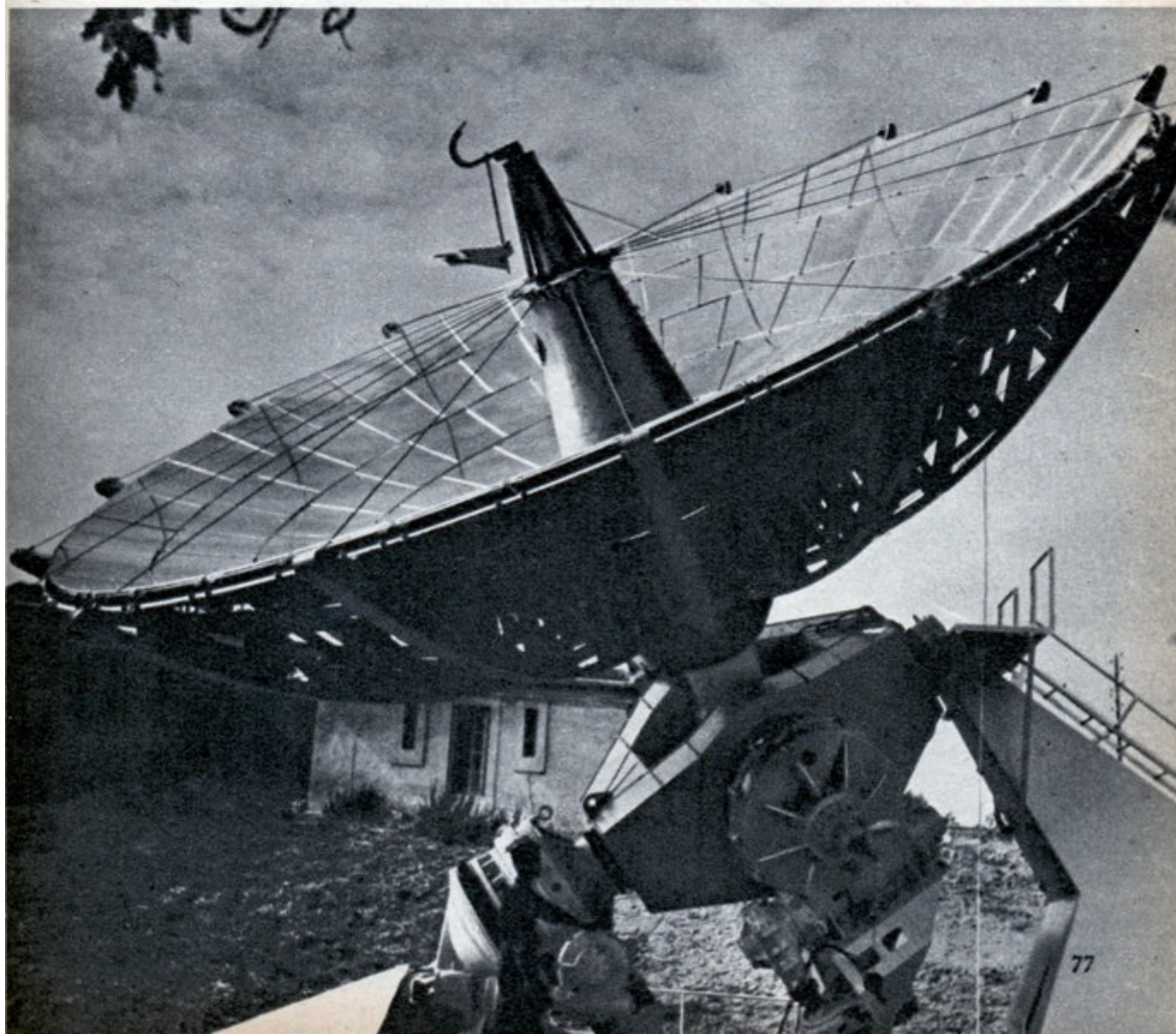
from the sphere's center section, would house cargo, power facilities, air-conditioning apparatus, plant cultivation tanks, labs, shops, etc. The propulsion gear might well be concentrated in the aftermost tip. Thus the spaceship would be divided into well-defined cargo, working and living areas.

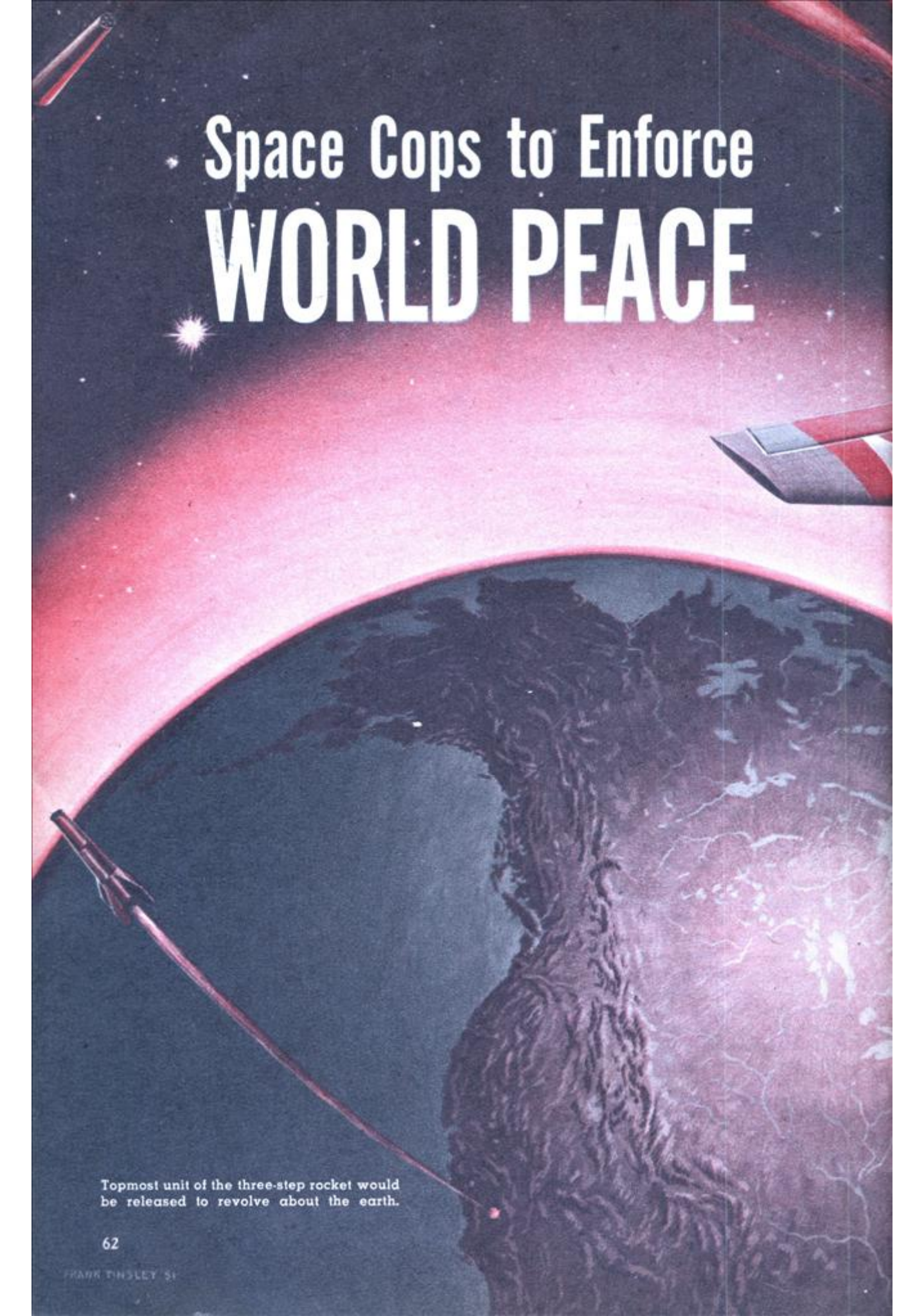
The crew would of course be carefully screened for ability, character and social compatibility and only the most completely adjusted applicants considered. While many past voyages of discovery, whaling cruises and the like, have kept crews cooped up in less comfortable craft for longer periods, it must be remembered that they could relax on occasional shore visits. The sunship's complement will be strangers in an alien environment, imprisoned in a tiny artificial world, completely dependent on

each other for the very breath of life. In space there are no tropical islands with whispering palms and welcoming native maidens; nothing but unimaginable extremes of heat and cold in an airless ocean that is totally hostile to life. Our crew must therefore be self-sufficient and perfectly integrated, as individuals and as a team. Only by such men and women can space be conquered.

While Dr. Stuhlinger's design is frankly theoretical, it is based on sound engineering and physical principles. With the rapid advances now being made it is not too unreasonable to hope that some of our younger readers will live to see a cosmic butterfly set off on a cruise through space—and perhaps a few of them may even have a hand in building and flying it. •

Solar heat plants now in use demonstrate practicality of space ship's power source.





Space Cops to Enforce **WORLD PEACE**

Topmost unit of the three-step rocket would be released to revolve about the earth.



Man-made satellite rocketships may soon revolve in endless orbits around the earth, policing our civilization.

By Frank Tinsley

NATIONS of the world are racing to send the first man-made satellite revolving in an endless orbit around the earth. In the hands of an aggressor, such a machine might mean slavery for all mankind, but as a police unit of the United Nations, it holds a promise of world peace.

Back in the closing days of 1948, when Secretary of Defense James Forrestal disclosed the existence of an "earth satellite vehicle program," the press and public reacted with a gasp of incredulous amazement. For the first time, responsible officials had dared to admit that they were seriously in-

SATELLITE
SEGMENT

INTERMEDIATE
SEGMENT

LAUNCHING
SEGMENT

RADAR DOME

INSTRUMENT SECTION

STABILIZERS AND WINGS
EXTEND FOR GREATER
AREA IN LANDING

ALCOHOL AND OXYGEN TANKS
DROPPED TO LIGHTEN SAT-
ELLITE SEGMENT FOR LANDING

PRESSURIZED CABIN SECTION

ROCKET ENGINE RING DROPPED FOR LANDING

ROCKET ENGINES

ALCOHOL TANK

OXYGEN TANK

Enlarged cutaway view of the satellite segment, above, shows its internal arrangement. The quadruple stabilizers in the nose retract into cases between the four alcohol tanks. Below these are four liquid oxygen tanks similarly nested into the ship's structure. Prior to landing, all these empty tanks are blown free by cartridges. The pressurized cabin is just below the tank section. It is divided in half by the upper part of the wing retraction cases and is lined with instrument installations. An access door and portholes provide entry and view. Four large ports in the top dome of the cabin give ample visibility for landing in a horizontal position. A jet engine is centered beneath the cabin floor with tanks on either side of it. Surrounding this installation is a ring-like section of the ship supporting the two rocket engines. This entire engine section drops free to uncover the jet for use in landing the space satellite.

General view of the complete three-step rocket, left, shows it in position for vertical launching. Each segment is complete in itself with a power plant and fuel tanks. The top segment is the satellite vehicle which contains the crew's quarters, instruments, and controls. The lower segments are booster rockets which are dropped off after exhausting their fuel in the first two stages of ascent. The lowermost section is fitted with fins and rudders for use while still in the atmosphere with adjustable legs for launching.

vestigating the fantastic dreams of Sunday-supplement screwballs!

To those in the know, however, the news was no surprise. The snowballing mass of scientific data on the space around us was no great secret. The problems involved in space travel—physical, engineering and human—were being methodically tackled and licked. Rocket designers' slipsticks were getting hot. Astronomers were calculating take-off ellipses and orbits. Physicists were feeding figures into vast mechanical brains and medical specialists were busy with the human angle.

Then, under the pressure of political crises, the furor was forgotten. No further news was forthcoming and, space wise, John Q. Public went back to sleep.

However, it was a short nap. During the past year, John Q. awoke again to a realization that this space stuff was more than mere entertainment. He heard solid technical men like William B. Bergen, vice president and chief engineer of the Glen L. Martin aircraft company, predict earth satellites in ten years.

Early in September, too, *Space Medicine*, a book edited by Prof. John P. Marbarger, Director of Research in the Aeromedical and Physical Environment Laboratory, was published. This book on the medical aspects of space travel is a symposium by eminent specialists in the field, including the Surgeon General of the Air Force. It covers the physical hazards of interplanetary travel, the ef-

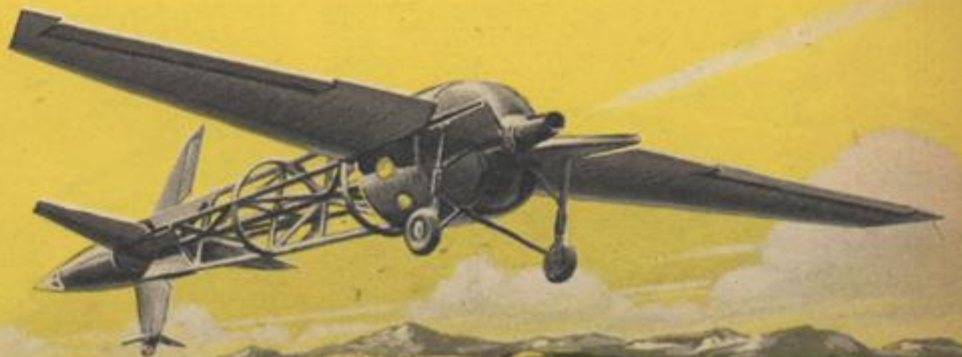
fects of rapid acceleration and loss of gravity, bioclimatology and the possibility of life on other planets in a scientific manner that leaves no doubt of the book's seriousness.

Then there was the meeting in London of the International Congress on Astronautics sponsored by the British Interplanetary Society. Gathered there were the world's leading rocket engineers, physicists, astronomers and space scientists. The consensus of opinion of the Congress was that a 50-ton earth satellite vehicle would be boring through space about 300 miles above the earth at a speed of 18,000 mph within a decade. In 25 years, they believe, flights to the moon may be possible.

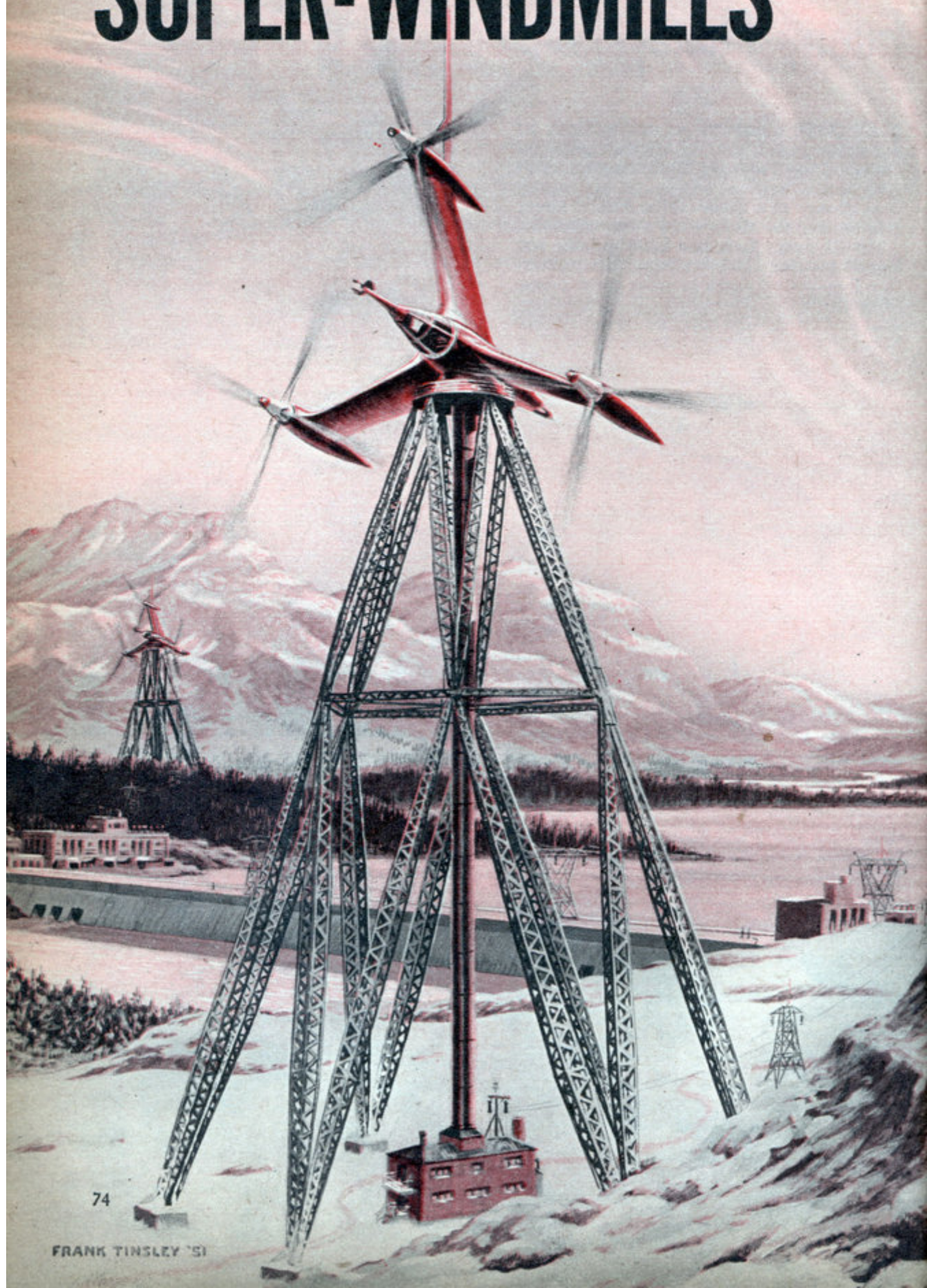
A paper on practical interplanetary rocket design by Dr. Wernher von Braun was even more specific. Technical director of Germany's wartime rocket research station at Peenemunde, Dr. Braun is the designer of the famous V-2 and now heads Uncle Sam's secret rocket center at Fort Bliss, Tex. He believes that all the basic engineering know-how to build a chemical fuel satellite is now at hand. Given sufficient money, it could be ready to go in five years! What's more, he has a preliminary design on paper right now, in the form of a huge, three-step rocket.

This multiple-step rocket builds up, by successive increments, sufficient speed to break the grip of the earth's gravitational pull. This escape velocity is roughly 23,000 feet per second. The [Continued on page 162]

Stripped-down satellite comes in for a landing with fuel tanks and rocket engine ring dropped and wings extended. Excess crew and records have been parachuted to safety. With the jet engine operating and the wheels lowered for the final approach, the satellite lands as slowly and easily as a light, twin-engine transport plane.

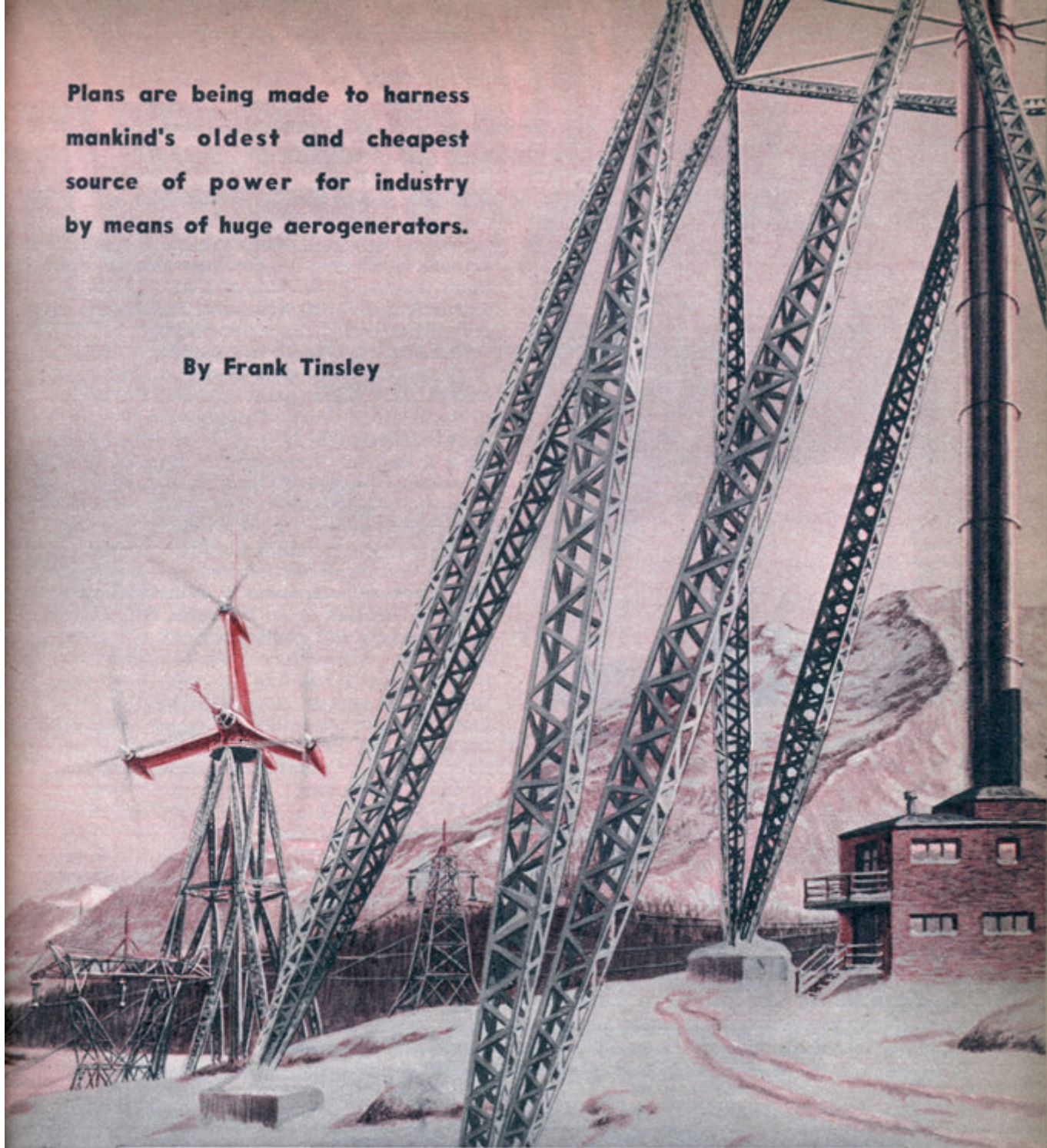


SUPER-WINDMILLS



Plans are being made to harness mankind's oldest and cheapest source of power for industry by means of huge aerogenerators.

By Frank Tinsley



THE next few years may see a decided change in the landscape of our country. In certain strategic places which promise a constant, strong wind such as mountain passes, will grow strange structures resembling the Martian machines of H. G. Wells. But these will be instruments of construction, rather than destruction—tall, steel towers supporting fans to convert wind energy into electrical power.

Members of the Congressional Interior and Insular Affairs Committee are enthusiastic over a new proposal to erect these machines. Introduced by Representative John R. Murdock, D.,



Scale model of the new super-windmill proposed by Percy Thomas. Generator is contained in head.

Ariz., chairman of the committee, a bill drawn up by the Department of the Interior and endorsed by the Federal Power Commission authorizes a \$2,750,000 government project to build a test aerogenerator.

In 1941, a full-scale instrument was built on a mountain top in Vermont and hooked up to the high tension system of the Central Vermont Public Service Corporation as an

auxiliary power source. Mounted on a 110-foot tower, its twin 56-foot blades were designed to develop 1,200 kilowatts at a wind velocity of 30 mph. Under favorable conditions, it actually developed 1,400. Although a practical success, structural and financial difficulties ended the experiment.

The newly proposed design is the product of years of research by Percy H. Thomas, well-known power plant engineer formerly of the Federal Power Commission. Towering 475 feet above the ground and equipped with a pair of three-bladed impellers, it operates automatically in a wind as light as 10 mph. At its maximum required velocity of 28 mph it delivers 7,500 kilowatts. During dangerously high winds the impeller blades can be feathered and braked to a halt and the structure is stressed to withstand hurricane velocities up to 200 mph. The plant is completely self contained with a central generator, converter, transformer, etc., mounted in a rotating housing atop the tower. The energy developed by the 150-foot diameter impellers is transmitted to the generator through geared-up shafting. All parts of the plant are accessible for inspection and repair.

The techniques of modern airplane construction suggest the possibility of further development of this design. (See illustration.) The use of light metals would lighten loads and relieve stresses. A central tubular elevator shaft would strengthen the structure, provide easier access to the operating head in foul [Continued on page 167]

This design with 175-ft. fan was tested on Grandpa's Knob, Vt. It worked well for three weeks.

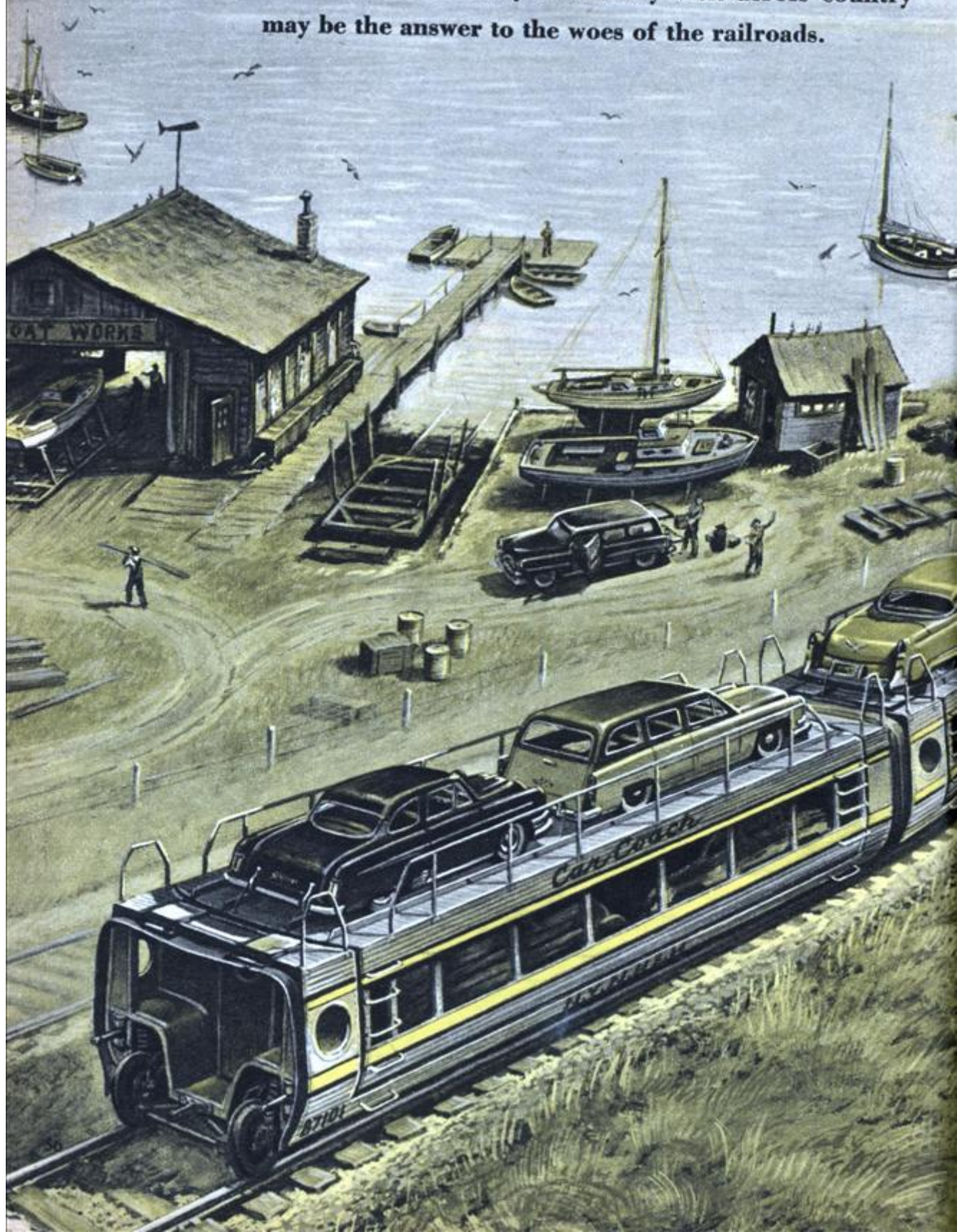
The farmer's wind generator for pumping water is efficient, has been popular for over 100 years.

British test generator in North Scotland is capable of standing mild winds or strongest gales.

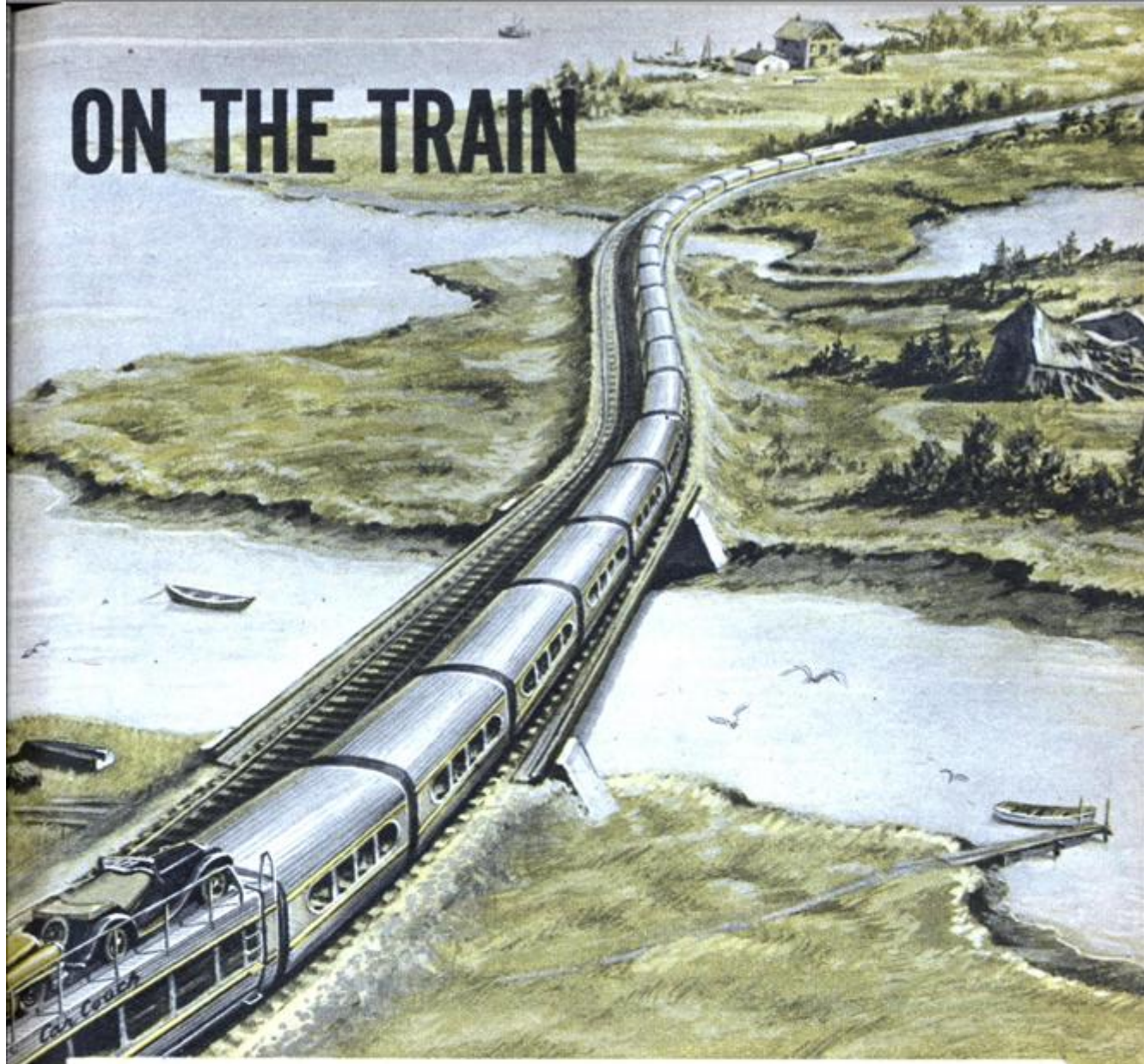


TAKE YOUR CAR WITH YOU

Car-carrying coaches that enable the traveler to
make a doorway-to-doorway visit across country
may be the answer to the woes of the railroads.



ON THE TRAIN



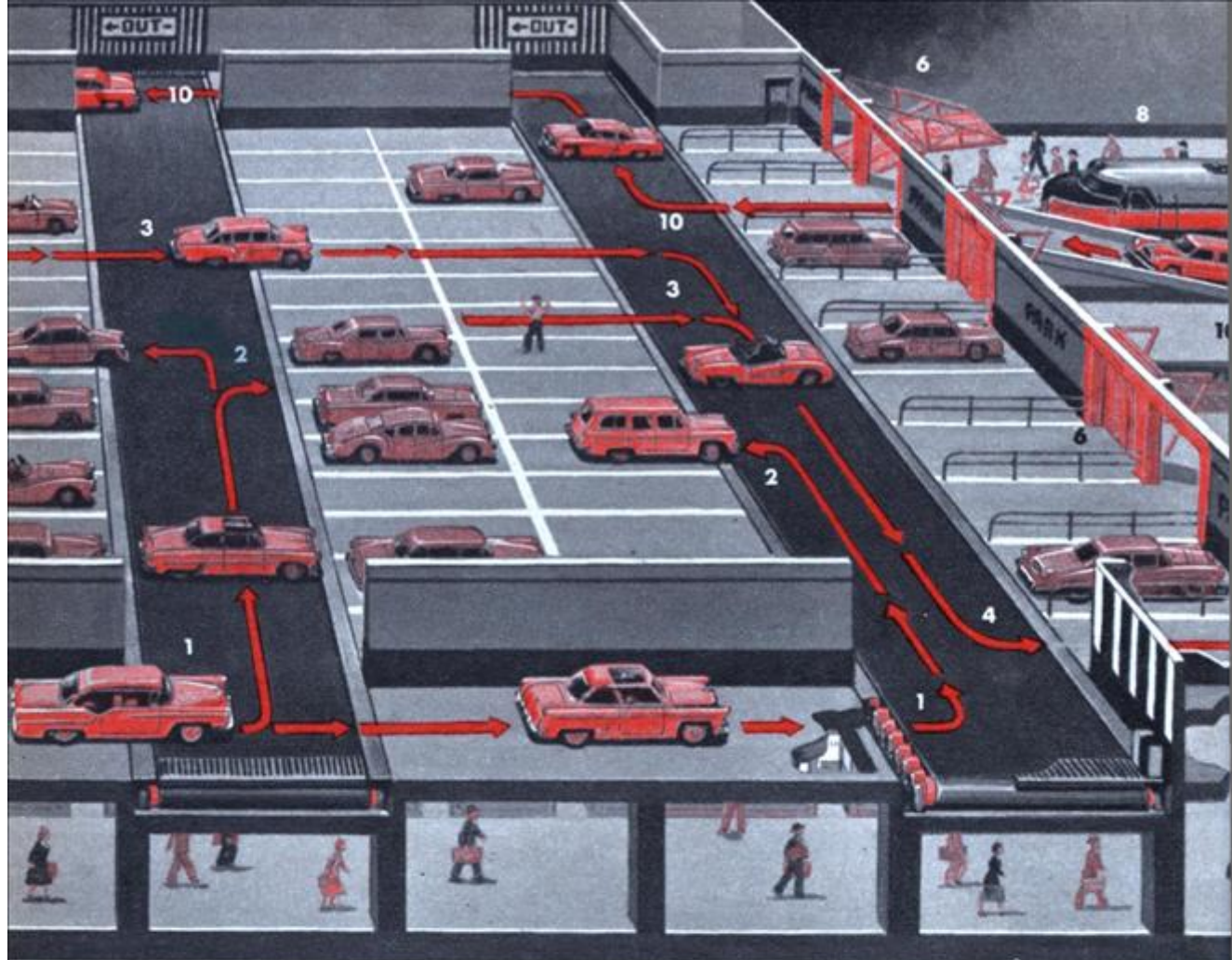
By Frank Tinsley

FOR some years now the famous old "high-ball" sign of America's railroads has degenerated into an "eight-ball" as far as passenger traffic is concerned. Not that travel has fallen off. Actually, John Q. Public's well-known itching foot is itchier than ever. It is just that rail service has been dragging its brakeshoes and the traveler has turned to more convenient means of transportation.

The reasons for this lamentable state of affairs are not hard to find. The rise of cross-country bus lines,

cut-rate air-coach service, super-highways and private automobile travel has hacked a substantial slice out of the railroad's passenger pie.

Alarmed by the steady drip of red ink, rail management has been trying to plug the leaking dike. So, apparently, have rail stockholders. During the past few months, operating control of several old, conservative lines has passed to more progressive hands and a general atmosphere of modernization seems under way. Advertising



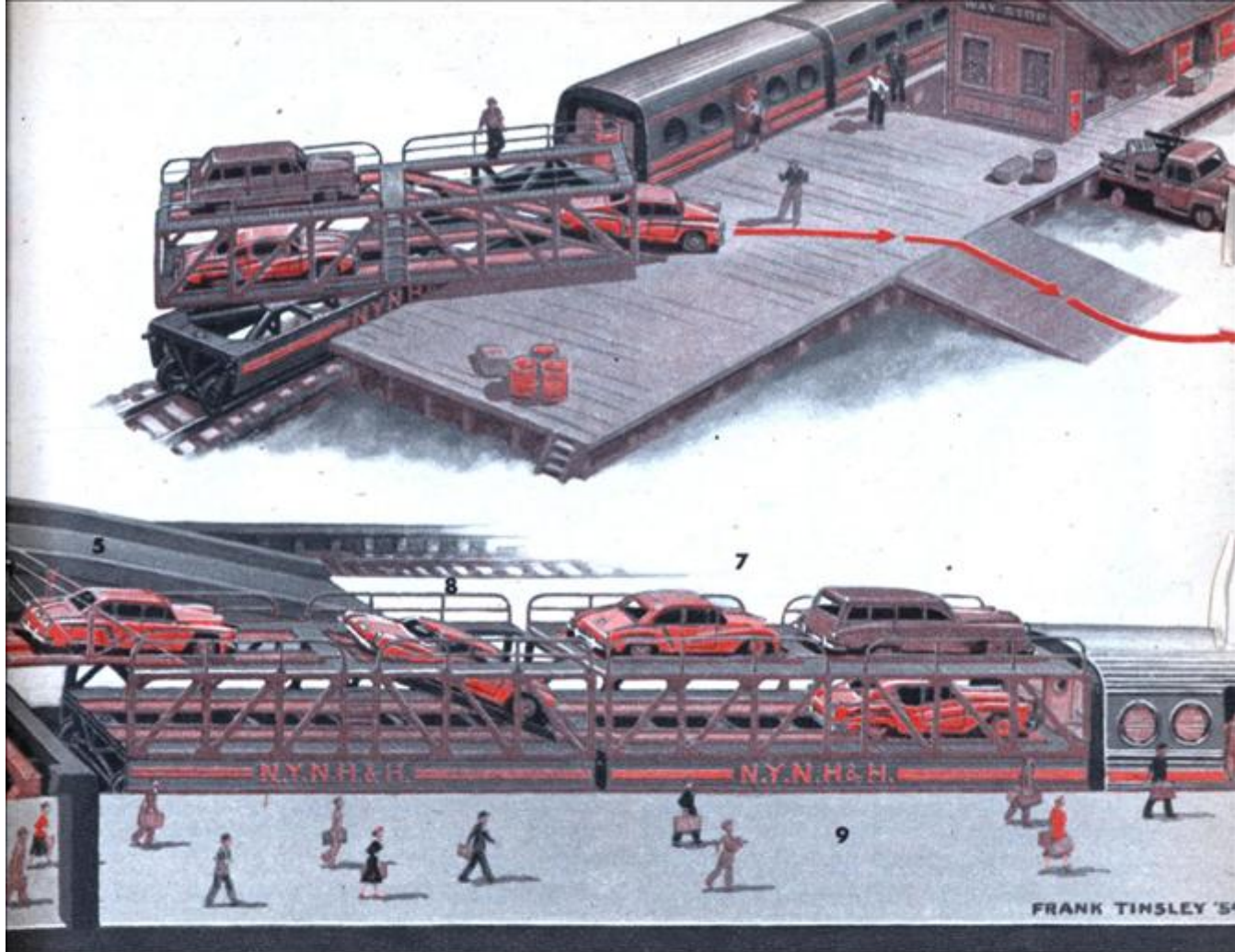
1. Entraining auto is driven onto the parking belt by attendant.
2. Belt shuttles the car sideways to vacant parking space.
3. When the train is ready, the auto is driven back onto the shuttle belt.
4. Belt moves the auto to the correct train-loading gate.
5. Auto is then driven through the gate and across the drawbridge to waiting train.

MI's terminal uses drawbridge ramps to load autos onto car coaches.

campaigns now depict the delights of train travel. Family plans and special rates have eased the bite on John Q's pocketbook and a whole new series of streamliners, luxury coaches, bars, grills and vistadomes combine to ease his seat, stomach and sight-seeing.

Perhaps the most radical break from the railroad's stage-coach past is the new Talgo Train, a caterpillar-like, lightweight speedster patterned on airplane construction principles. Originated by a Spanish engineer named Goicoechea, the design was taken up by a Spanish firm, *Patentes Talgo*, and a well engineered prototype developed and built by our own American Car & Foundry Corporation.

In addition to its lightweight, short, articulated car sections and "guided axles" which steer the wheels around curves, Talgo's chief characteristic is its "piggy-back" system of suspension. Each unit has but one pair of wheels, situated at its rear end. The forward end of the coach rests and pivots on the wheels of the unit ahead, somewhat like a trailer truck, and is drawn along with a minimum of effort. Vibration is absorbed by long travel, spiral springs and the wheels are equipped with king-size, automobile-type brakes. With an underslung frame and a car floor that almost seems to skim the roadbed, the Talgo's center of gravity is a good two feet lower than that of the standard



6. Drawbridges fold to form doors when not in use. 7. Autos are driven across car-connectors and parked in order of their destination. 8. Train car's upper driveways are hinged to permit access to lower deck. 9. Passengers entrain from the lower level platforms. 10. Detraining autos are unloaded and then driven up ramps to exit roadway.

At way stations, special swivel-top can easily unload the vehicles.

railway coach. This, plus the steerable wheels, permits it to round curves at speeds that would derail the conventional train.

This record, along with recent demonstration runs, has created a decided stir in U. S. railroad circles. A committee was sent to Spain for a first hand report and the presidents of several large eastern systems met to consider the Talgo's possibilities. When enough rail lines agree on a standardized model and come up with firm orders, a mass production assembly line can be set up and costs cut far below present estimates. Patrick B. McGinnis, the energetic, imaginative new president of the New Haven Railroad, says that if this is done,

he will be interested in purchasing at least 20 and perhaps 30 Talgo Trains. Robert Young, who espoused the ultra model Train X when he was president of the Chesapeake & Ohio, and who now bosses the great New York Central system, is expected to follow suit. The head men of the Pennsy, B & O and other lines, are equally interested.

All this sounds fine for both the railroads and the traveling public. But there is still a big, fat fly in the roads' passenger-revenue ointment. This is the growing group of ex-rail users who now make even the longest and most arduous trips in their own automobiles. Some think it more convenient just to toss their luggage into the family car,



Experimental diesel electric locomotive with six articulated units recently did 102 mph.

slip on some informal duds and drive directly from doorstep to doorstep. And so it is—if the distance is not too great. Another large segment is made up of the false economists. These penny-wise characters figure the gas and oil bills against seemingly higher rail fares and decide to save by driving. What they fail to reckon with, of course, is the expense of motel stops and the extra meals made necessary by the longer road trip.

These are the people railroad passenger agents are re-surveying with acquisitive eyes. Mr. McGinnis, a firm believer in the volume theory of personal rail transport, puts it this way: "The New Haven now carries around twenty million passengers a year—just about all the business traffic in the area. The market we are seeking to develop is that of the pleasure traveler who is now going by car. We *have to get 'em back* if we are ever going to get our passenger department out of the red!"

There is one point which Mr. McGinnis has missed. That is the problem of people who want to travel by rail but who would like to take their cars along with them. Steamship lines catering to tourists have long offered this service. Car ferries transport vacationists and their automobiles between Florida and Cuba, U. S. and Canadian ports and many other points, here and abroad. In

England, there is even a cross-channel air car-lift that flies the family and its bus to and from Paris! When airlines, weight-sensitive as they are, can carry autos, what in tarnation is holding back the railroads?

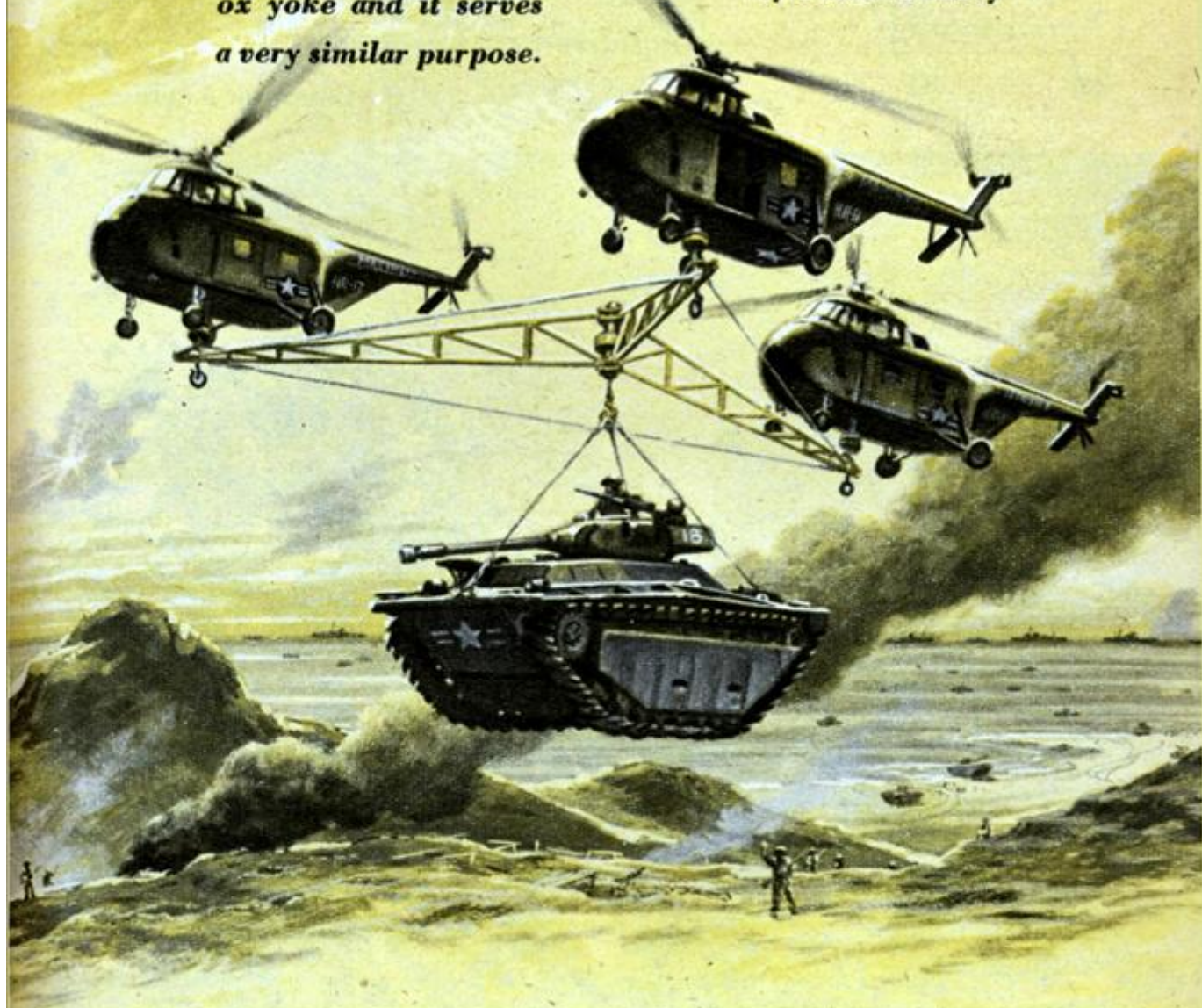
MI believes that the old iron horse has missed a bet in ignoring this type of service—that the passenger should be able to drive to a depot, check his car through to his destination and drive it away at the other end of the run. The "carfare" would have to be fairly high, of course, but compared to the road costs of a two or three day trip, not to speak of the personal fatigue involved, the difference should not prove too excessive. With this in mind, the author has prepared two concepts of possible "car coach" superstructures, adapted to the new, high speed Talgo running gear.

Fundamentally, they are the same design. One, shown in the diagrammatic drawings, is a stripped down utility model. The other, pictured in the lead illustration, has been prettied up to conform to the flowing lines, window and panel patterns of the Talgo Train. Two, four and even six-car coaches are possible. However, the Talgo philosophy of short, highly articulated, lightweight components, make a 25-foot, two-car unit the most practical from the point of view of weight saving and operational flexibility.

TRICOPTER SKYHOOK

*It's as simple as an
ox yoke and it serves
a very similar purpose.*

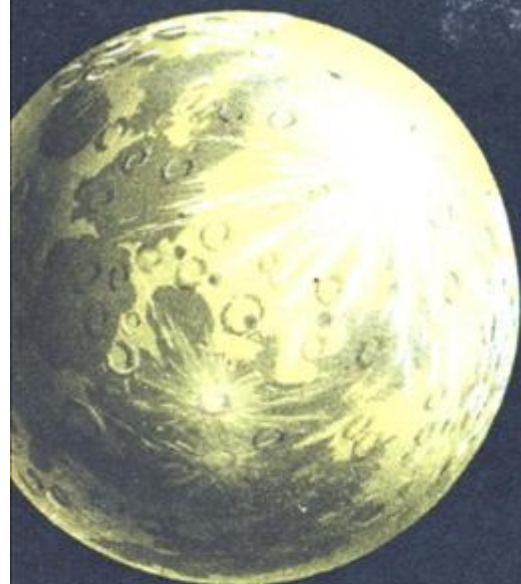
By Frank Tinsley



WHEN a heavy hauling job comes up the idea has always been "Put in more horses." Now, Raymond A. Young, an ex-Navy aeronautical engineer, has made it possible to harness helicopters in teams. His harness, as uncomplicated as an ox yoke, is a tubular framework that holds the working whirlybirds far enough apart to give them rotor room.

Various adaptations of Young's basic idea may be used. The one illustrated is a tricopter harness consisting of three girders hinged to a central vertical hoist

and braced in a rigid triangle by steel cables. Above the outer end of each girder is a universal coupling which attaches to the bottom of a helicopter with a quick release fastening. Each of the machines is separately flown but all follow the commands of a chief pilot, given over interphones. Young's multi-copter harness can pick up bridge sections, ferry vehicles and equipment, emplace artillery in otherwise inaccessible positions—using standard copters instead of expensive specialized equipment. •



TOEHOLD



Tiny moonlets, encircling our earth, might be used as jumping-off points for space travel.

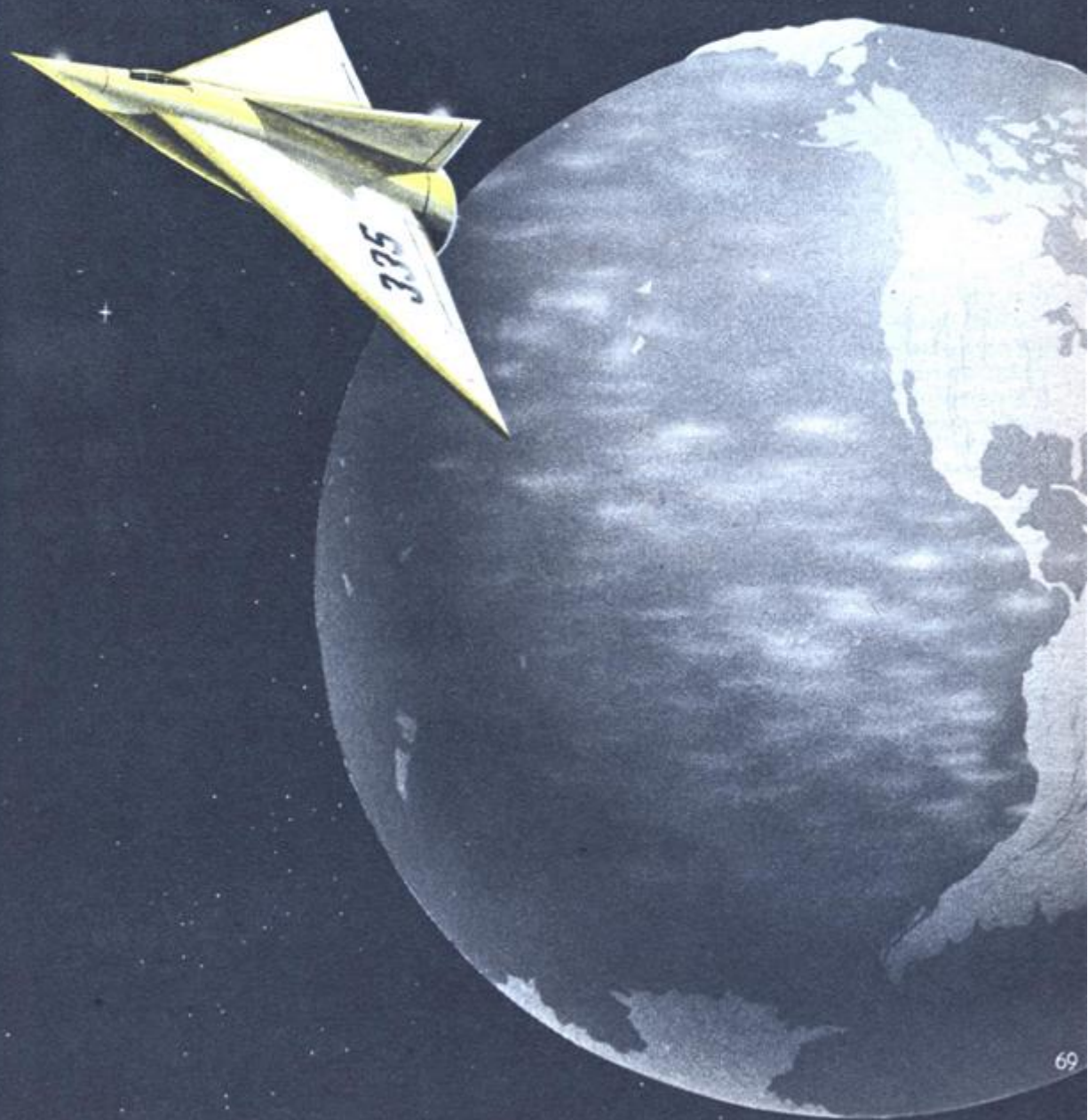
By Stanley Carson

HOW many moons has the earth? If your answer is *one*, you may be wrong! Astronomers believe that there actually are one or several small satellites orbiting with tremendous speed between the earth and the moon.

If the predictions of our astronomers are correct, and there are a number of small moons circling the earth at short distances, then space travel may become a reality many more years sooner than is anticipated. For the *moonlets* which our government is now searching for can be used as ready-made stations in space. It would not be necessary for rocket ships to carry thousands of tons of structural material into space to construct an artificial satellite. The foundation for man's first celestial outposts would be ready and waiting and only a minimum of materials for living and working quarters would be necessary.

The Department of Defense has decided that the possibility of moonlets existing in space between the earth and the moon is sufficient to warrant an immediate astronomical survey in an attempt to locate the exact position of these small bodies. A telescopic search is now being made for the government by Drs. Clyde Tombaugh and Lincoln La Paz, directors of the Institute of Meteoritics of the University of New Mexico.

IN SPACE





In a recent interview Dr. La Paz said that the United States had "better get on the ball quickly" if it is not already working on a station in space. He believes that if the search for a small, nearby moonlet is successful it can be built up as an outpost in space.

"Using such natural stations," said Dr. La Paz, "would save many billions of dollars of taxpayers' money which would otherwise have to be spent building an artificial satellite vehicle."

Many astronomers and scientists believe the chances of eventually finding the moonlets are good. It has been pointed out that while the earth has only one known satellite—the familiar moon—other planets have from two to eleven small bodies as moons and that many more probably exist, but have not been seen in telescopes.

Mars, for example, has two tiny moons, *Phobos* and *Deimos*. Compared to the earth's moon with a diameter of 2,163 miles, the two tiny satellites of Mars can hardly be classed as moons, but rather fit into the smaller category of moonlets. *Phobos*, 5,800 miles from the planet, is only 10 miles in diameter and *Deimos*, 14,600 miles from Mars, is but five miles in diameter!

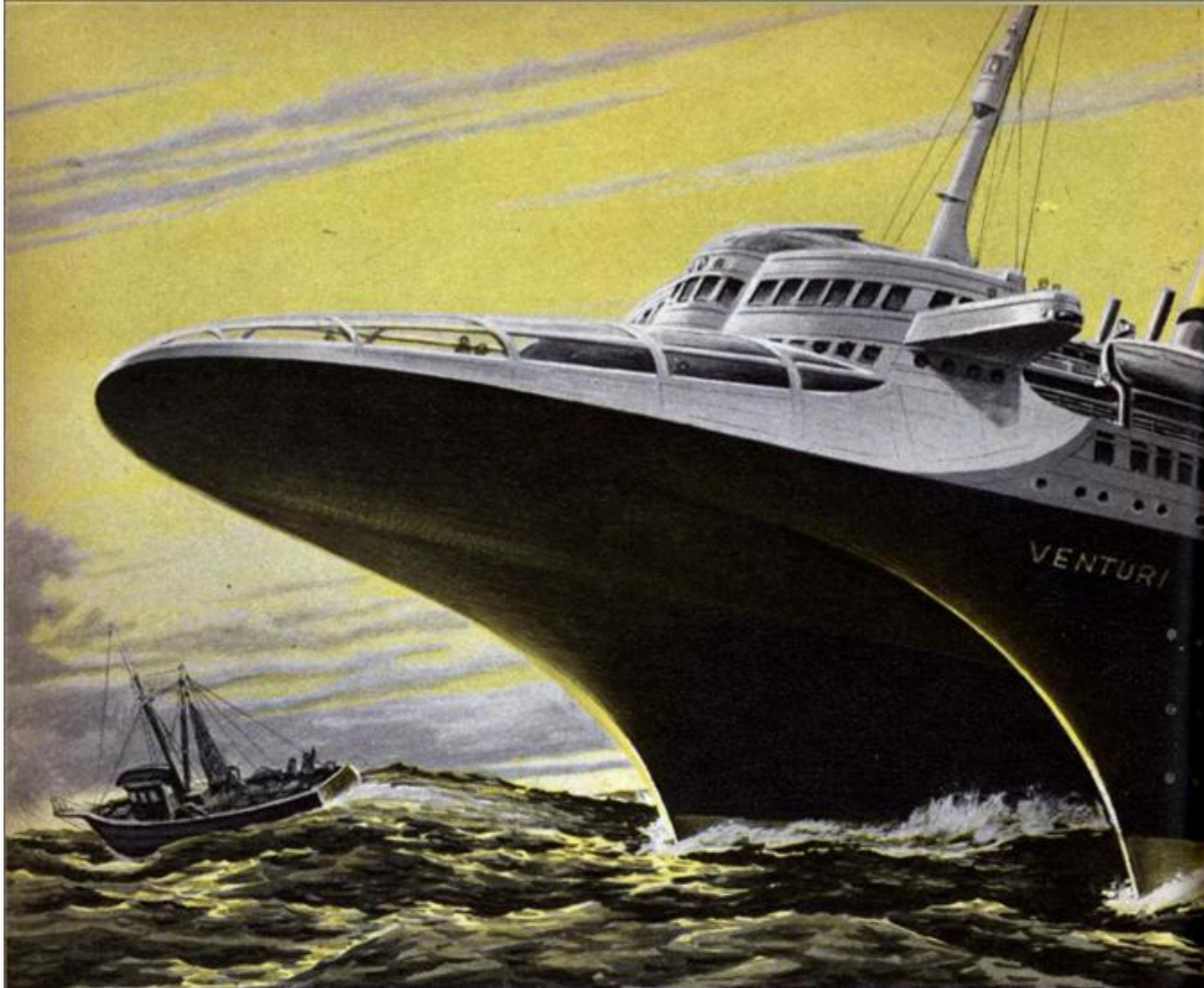
With its eleven moons, Jupiter is a perfect example of a solar system in miniature.

Its satellites range from moonlets an insignificant 15 miles in diameter to two great bodies, *Ganymede* and *Callisto*, each 3,200 miles in diameter. The closest moon of Jupiter is only 112,600 miles from the monster planet and the most distant orbit is 14,880,000 miles away.

Space abounds with smaller bodies variously described as planetoids and asteroids. *Ceres* is the largest known of these wandering nomads of the solar system and is 480 miles in diameter. The planetoid *Hermes*, one mile in diameter and with a mass of three billion tons, can come as close to the earth as 220,000 miles—closer than our moon. The majority of the "minor planets," however, are less than 50 miles in diameter. At least 1,500 are charted and their orbits known.

There is good reason to believe, therefore, that the earth also may be the mother world of one or a group of small moonlets. These may circle our planet anywhere from 1,000 to 200,000 miles out in space though they are probably quite close to the earth, which accounts for their not having been sighted before.

According to Dr. C. M. Clemence, director of the Nautical Almanac Office of the United States Naval Observatory in Washington, the [Continued on page 218]



Tunnel-Hull Boat Won't Roll

GAR Wood, the silver-haired king of speedboat racing, has designed the most stable boat in the world.

The no-roll Venturi is 188 feet long and 40 feet wide, and has twin hulls which slice through the waves instead of climbing over

them as do conventional craft. Propellers are 4½ feet in diameter and extend below the hull, increasing draft at the stern to about 8 feet when underway. At 26 knots the air rushing through the tunnel buoys up the ship so that she draws only 6 inches

Gar Wood shifts variable pitch propellers from astern to neutral to ahead by remote control.

At 26 knots waves roll their crests along her sheer sides while she rides along undisturbed.



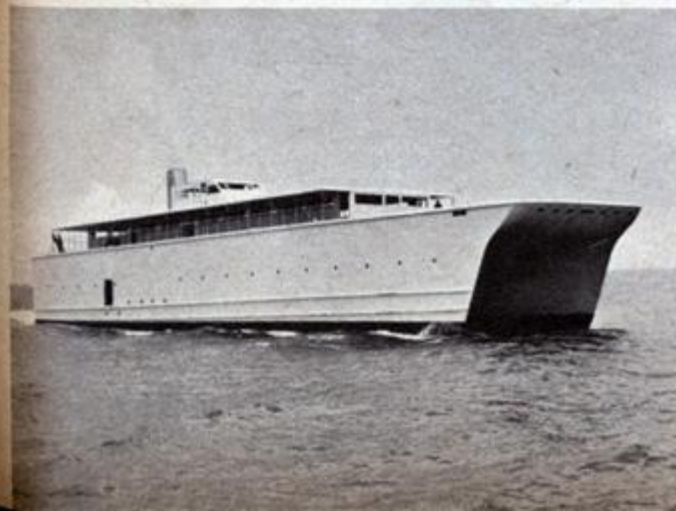
Tests show that a 16,000-ton liner of Wood's design would have a speed of 38 knots, more than any other commercial vessel, at 120,000 horsepower. The Queen Mary of 80,773 tons has a speed of 32 knots with 200,000 horsepower.



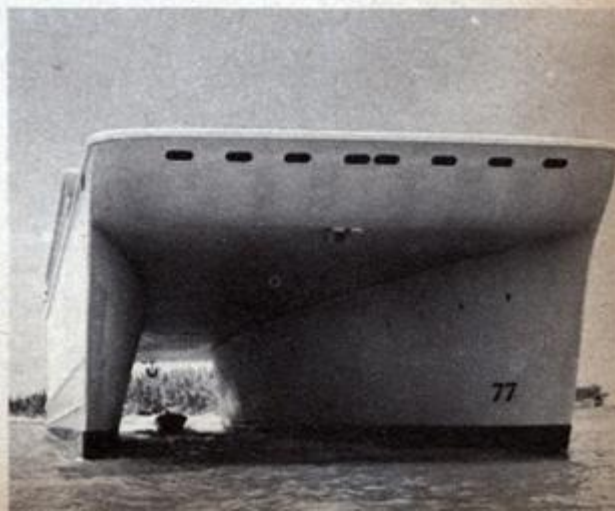
of water at the bow. This air cushion also acts as a shock-absorber for all up-and-down movements of the boat. Wood says, "We have sailed in seas so rough that 60 of our 188 feet have been out of water between wave crests, and have made full-rudder turns at top speed with waves 10 feet high and we didn't heel over more than one or 2 degrees."

The present model was originally designed as an AAF target vessel resembling a baby flat-top. It has four pancake Diesels totaling 4,800 horsepower, is flat-bottom with a gross weight of 120 tons. Engine rooms are located $\frac{2}{3}$ of the way aft in each hull. Hulls are planked in $\frac{5}{8}$ -inch 9-ply mahogany. Forty watertight bulkheads make it unsinkable. •

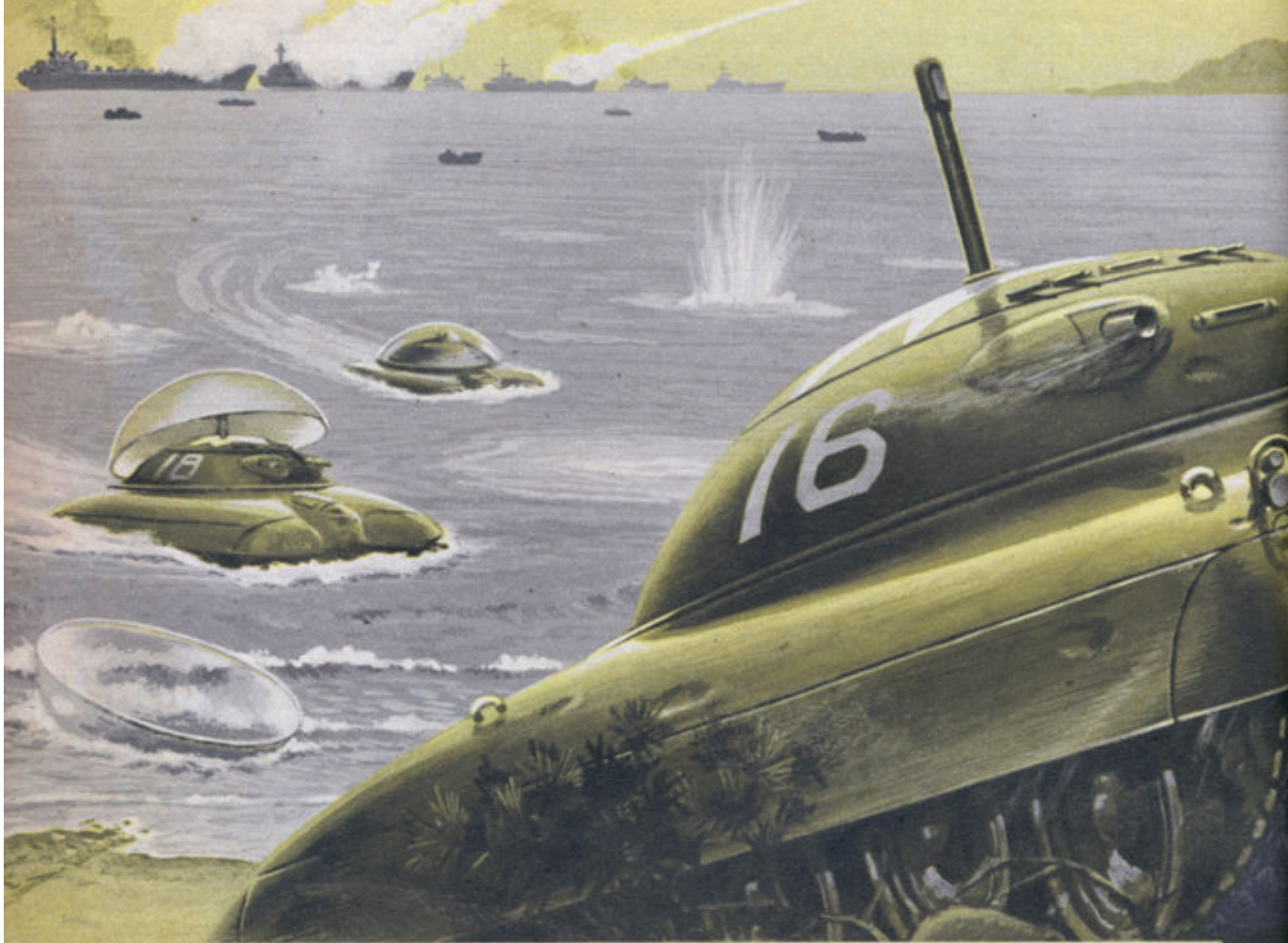
Large mass above water is subject to wind so retractable propeller will be used for docking.



A special fishing cruiser fits flush under the tunnel and can be lowered quickly when desired.



Why Don't We Build... **UNDERWATER TANKS**



***We need such a weapon for beachhead invasions . . .
we have already solved its technical problems.***

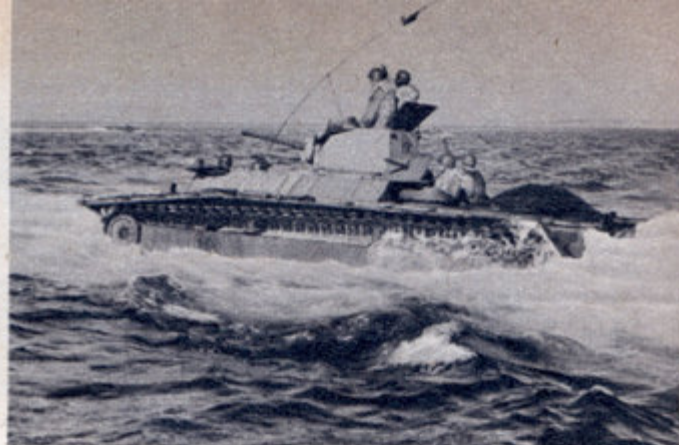
By Frank Tinsley

EVEN at the outset of our World War II campaign of island conquest in the Pacific, it became evident that some form of armor was needed to spearhead landing operations. The old technique of wooden landing barges and surf-spattered Marines was obviously inadequate. To pit unprotected flesh and blood against an array of underwater obstacles, mines and wire entanglements, backed up by well concealed and heavily bunkered machine-gun nests, mortars and artillery, was a murderous waste of expensively trained men.

An attempt to answer the problem was found in the Alligator, an amphibious tractor developed by Donald Roebling for rescue work in the Florida hurricane

continued on page 76





belt. It was redesigned hurriedly in light armor plate, armed with forward firing machine guns and given the designation LVT (Landing Vehicle Tracked). It had an armored pilot house forward and a large, open cockpit accommodating 40 fully equipped Marines who promptly nicknamed it their "Invasion Taxi." Able to swim, scramble over coral reefs, negotiate soft beaches, swamps and mudholes, and bull their way through jungles, the Alligators were hailed with joy and were instrumental in saving thousands of Leatherneck lives.

Good as it was, however, the Alligator was not good enough. Its water speed was low, making it an easy target. Then, too, its armor was too light to turn anything larger than machine-gun bullets and the crowded cockpit was an open invitation to shell fragments.

An improved model, the LVT (A)1 (Landing Vehicle Tracked, Armored), was the next step. The idea of an "amphtrack" or armored landing barge designed to carry assault troops to the beach was abandoned in favor of a more heavily armored assault machine carrying only its own crew.

The Water Buffalo, as it was christened, was decked over like a tank and packed a 37-mm. cannon in a revolving turret. In addition, two shielded .50-cal. machine guns were mounted on hatches in the after deck. Far more formidable than its pred-

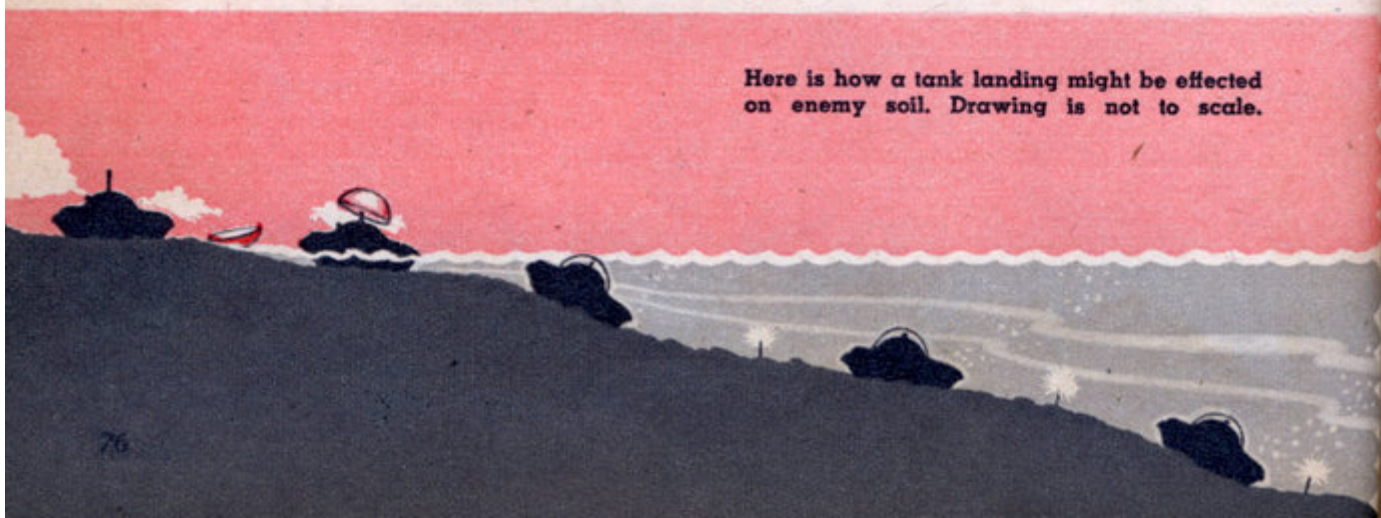
ecessor, the Buffalo could mop up shoreline machine-gun and mortar nests before a single soldier hit the beach. In later models, a 75-mm. howitzer was substituted for the 37-mm. gun which made the steel monster still more potent.

This was the weapon with which we wound up our war in the Pacific. It is still the navy's specialized instrument for amphibious landings. However, it is not the final answer. Slow in the water, forced to cover considerable distances in plain view of defense batteries, the Water Buffalo is more or less of a sitting duck for enemy gunners. Because it must float, it is of necessity less heavily armed and armored than its land counterpart and consequently less able to withstand defensive bazooka and recoilless-rifle fire.

A better solution is important to any counter-offensive problem in modern war as was proved in Korea, where a series of landing operations was necessary. Just what kind of a weapon is needed? Obviously, it must be something bold and unconventional, for we have almost exhausted conventional means.

Fast, armored landing craft have been tried but they still spill unprotected men on a fire-swept beach. They have their place, certainly, but only in followup waves of attack. Larger and more rugged descendants of the Buffalo would be better able to withstand enemy fire while afloat

Here is how a tank landing might be effected on enemy soil. Drawing is not to scale.



GEAR PLEXIGLAS DOME
WITH WATERTIGHT GASKET,
COVERS ROTATING TURRET
WHILE UNDER WATER

EMERGING FROM WATER
EXPLOSIVE CHARGES BLOW
DOME CLEAR OF TANK, UN-
COVERING TURRET FOR ACTION

ALL HULL HATCHES ARE
EQUIPPED WITH WATER-
TIGHT RUBBER GASKETS

PERISCOPE RETRACTED
INSIDE DOME, PERMITS
UNDERWATER VISION

At far left is the Alligator, a lightly armored, open cockpit craft extremely vulnerable to shore fire. In the center is the Water Buffalo, a floating tank lightly armed with a small cannon and several machine guns. At left is the proposed model blowing its plastic bubble top.

but would prove too unwieldy for subsequent land operations. Land tanks might be floated ashore on detachable, self-propelled pontoons. Like other surface craft, however, they are subject to heavy defense fire during the process. And if one of the pontoons were hit and opened, its tank would head for the bottom like a huge, steel sinker.

"Well, then," you ask, "wot-in-ell can we do? Put tracks on submarines and roll them up the beach?"

You may be closer to the answer than you think. If an adequately armored tank is too heavy to float, why not let it sink to the bottom and roll up to the beach under water? It needs only suitable sealing, a temporary air supply and a means of guiding it along passable, ocean-bed trails.

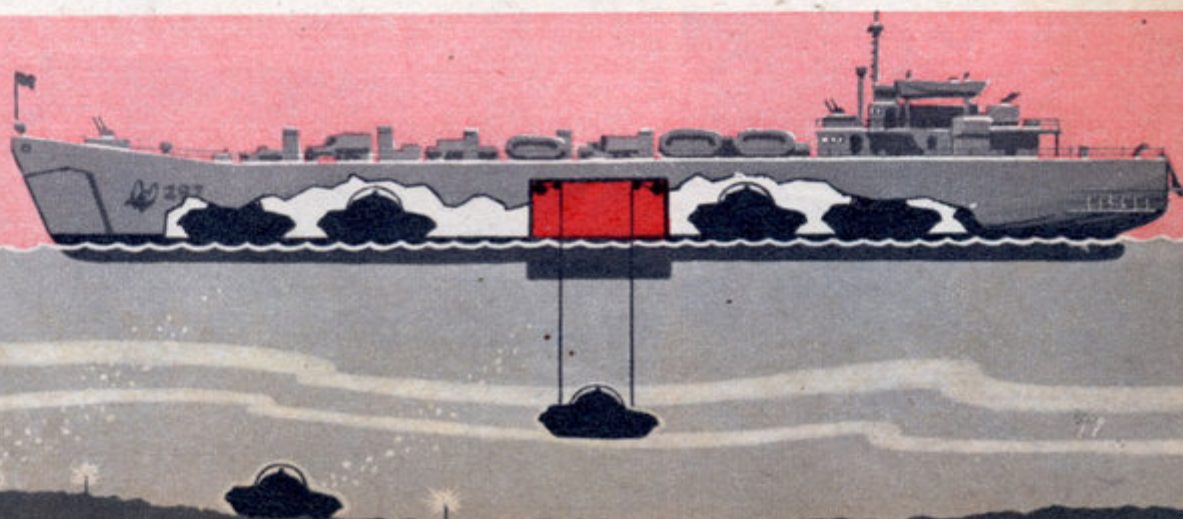
Let's take a look at the technical problems involved.

The Alligator and Water Buffalo, plus several pre-war amphibious tank designs, have proved that watertight, armored hulls can be successfully combined with practical track gear. So far as underwater sealing, air supply and sea-floor operation are concerned, a working prototype already exists. See the undersea explorer's submarine in the June '50 issue of *MI*. It is true that this machine is designed like a baby submarine with track gear. It has none of the armament, free-swinging turrets, etc., that a

fighting tank requires. But those are problems that can be licked, too—if we really set our minds to it.

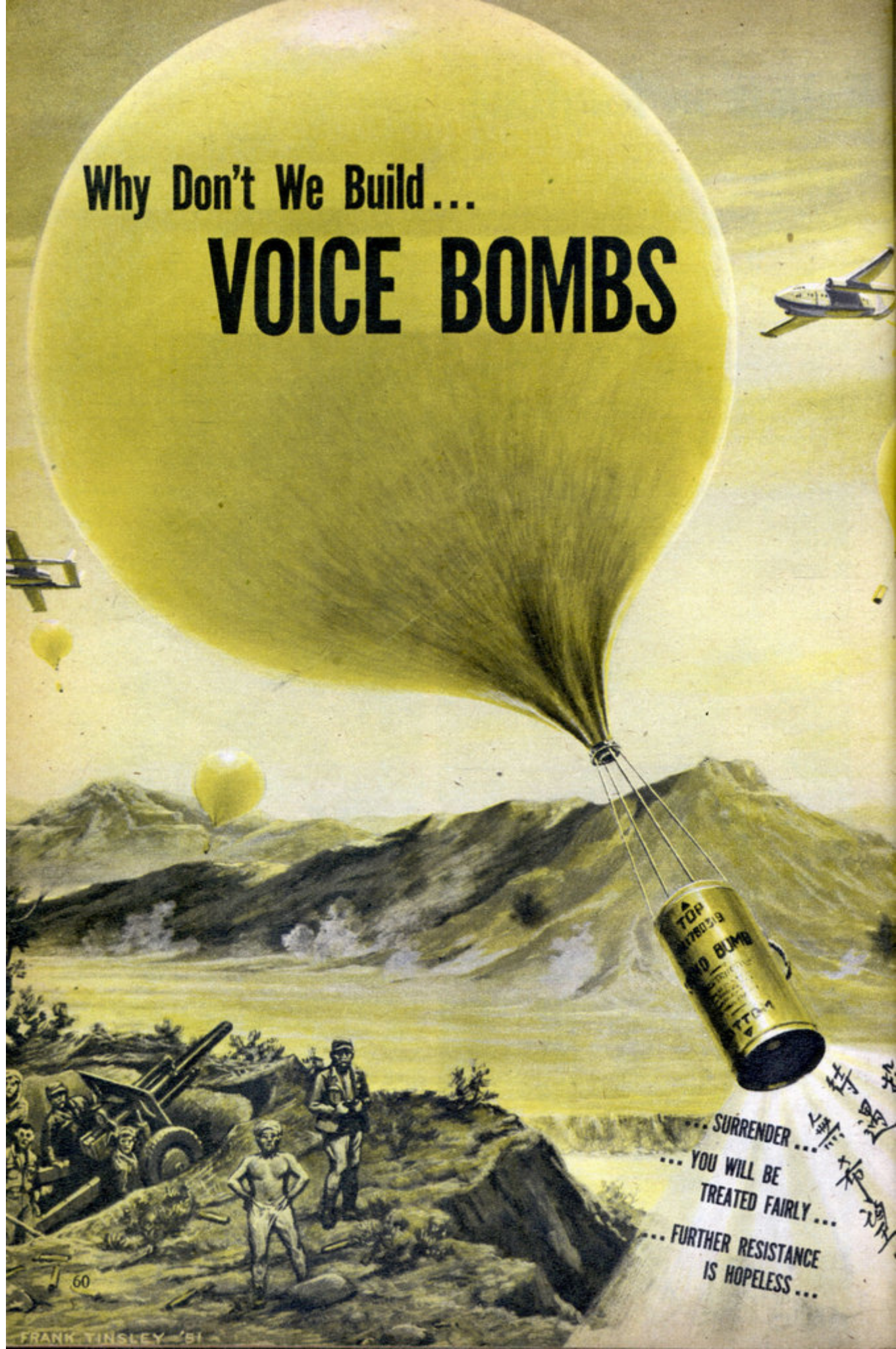
The hull, with its escape hatches, air inlet and exhaust ports, presents no great difficulties. All have been long since solved in standard submarine practice. The main problem lies in the turret. Here we are faced with an entirely separate unit, mounting a heavy, long-barreled gun. It must be capable of 360° rotation and its gun must have a 90° elevation. Mounted on a motor-driven, ball-bearing traversing ring, it is difficult to render waterproof, especially since the gun and turret must be free to swing into action as soon as the tank emerges from the water. And whatever freeing is necessary should be done from inside the tank.

If we can't waterproof the turret itself, why not cover the whole thing with something that can be waterproofed! Let's take our cue from aircraft design. The modern jet fighter faces a similar problem in a different medium. The pilot's cockpit is like a fish bowl in reverse. Surrounded by the thin, icy air of extreme altitudes, it must be kept filled with heavy, breathable air, warmed to the proper temperature and enriched with oxygen. This means that the cockpit enclosure must be airtight, strong enough to resist wide differentials in pressure and transparent enough for good visibility. Also [Continued on page 190]



Why Don't We Build...

VOICE BOMBS



Dropped from bombers over hostile territory, midget tape recorders suspended from balloons could speak messages of propaganda directly to enemy soldiers.

By Robert Hertzberg

IT is an hour before dawn. Exhausted from long nights and days of continual battle, enemy troops are enjoying a brief respite, sleeping fitfully in their foxholes.

Suddenly the night air is shattered by a voice thundering from above. In a few minutes hiding places are emptied as the bewildered soldiers, startled into alertness, seek to identify this strange, new apparition. They listen as the voice speaks in their native tongue.

"Oppressed citizens of the dictatorship, this is the voice of friends advising you to surrender. Unless you turn on the cruel masters who forced you into a senseless war—unless you lay down the arms you have taken up against us—we will be forced to destroy you with our superior numbers and deadly weapons. Be smart—live! You



Meteorological balloons, such as those used to carry radio-sonde units, are adaptable to suggested voice-bomb warfare.

in another form has already demonstrated its vast potentialities as a psychological warfare weapon.

The famous Man From Mars radio program broadcast by Orson Welles just before the war was an innocent bit of fiction, presented purely as entertainment. Yet it produced widespread panic in the immediate vicinity of a large East Coast city among people who would laugh if you called them ignorant or superstitious. It is a matter of cold record that in some areas farmers locked their women-folk and children in storm cellars and then mounted guard outside, armed with hunting rifles and shotguns, to await the invaders from another planet.

The Army says nearly one-third of the 200,000 Chinese and Korean Communist prisoners were captured through psychological warfare. Brig. Gen. Robert A. McClure, chief of the Army's psychological warfare branch, has publicly endorsed

voice-from-the-sky techniques.

The voice bomb proposed here by **MECHANIX ILLUSTRATED** is entirely practical. About 90 per cent of the parts required for it are standard radio components; the other 10 per cent can easily be made to order. The bomb can consist of a compact tape player, a powerful amplifier using the midget tubes and other miniaturized components already in production for military communications equipment, a loudspeaker and a set of cheap, short-life batteries. All the parts can fit neatly into a cardboard cylinder about a foot in diameter and two feet long, with the loudspeaker mounted in the lower end so that the container itself acts as a fine directional reflector to direct

outnumber your superiors a hundred to one—obey their treacherous orders no longer! Surrender! You will be treated fairly . . ."

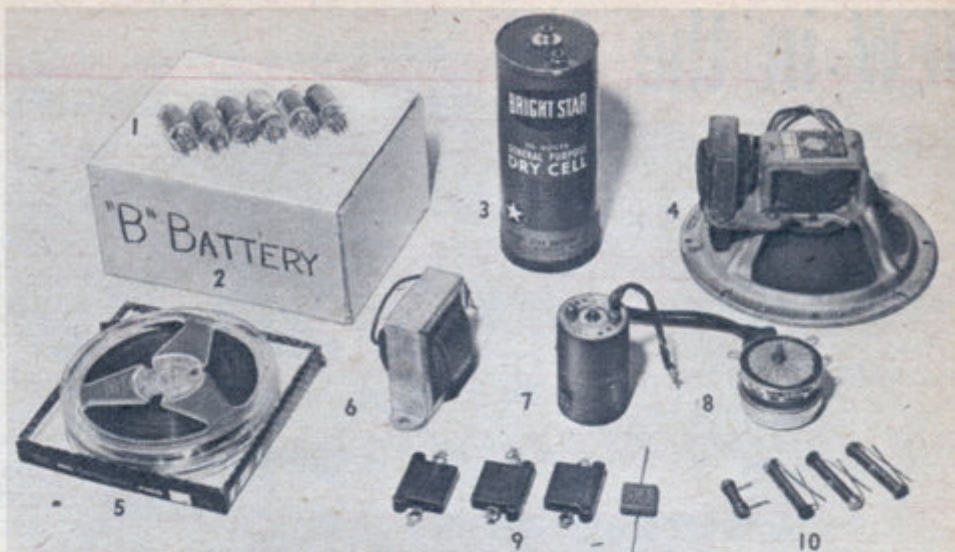
Some of the troops shoot wildly into the air but relentlessly the voice from nowhere continues its deadly work of creating consternation and terror among the enemy. Many slip quietly off into the darkness to surrender. Still others, badly demoralized, desert their units. Long before sunlight reveals its location, the voice bomb has completed its mission.

"Just science fiction," you say? Unlike many other radical ideas being proposed to our military planners, the voice bomb is not only a very simple technical project but



The basic components of the voice bomb are these common electronic parts:

1. Miniature radio tubes;
2. Radio B battery;
3. No. 6 dry cell;
4. Loud speaker;
5. Paper recording tape;
6. Transformer;
7. Midget motor for tape;
8. Automatic timer;
9. Condensers;
10. Resistors.



How A Voice Bomb Can Be Made

the sound earthward toward its target.

The cylinder can be sustained aloft, after being dropped from a high-flying plane, by a medium-sized balloon. The latter is packed in the upper end of the container and is inflated by compressed gas in cartridges of the kind used for life rafts, Mae Wests, etc. A simple mechanical wind-up timer, adjusted by the bombardier, releases the gas and turns on the equipment when the bomb falls to an altitude of about 1,000 feet above the target.

The whole gadget shouldn't weigh more than 25 pounds nor cost more than about \$50 each in quantity. The heaviest items would be the batteries. However, since

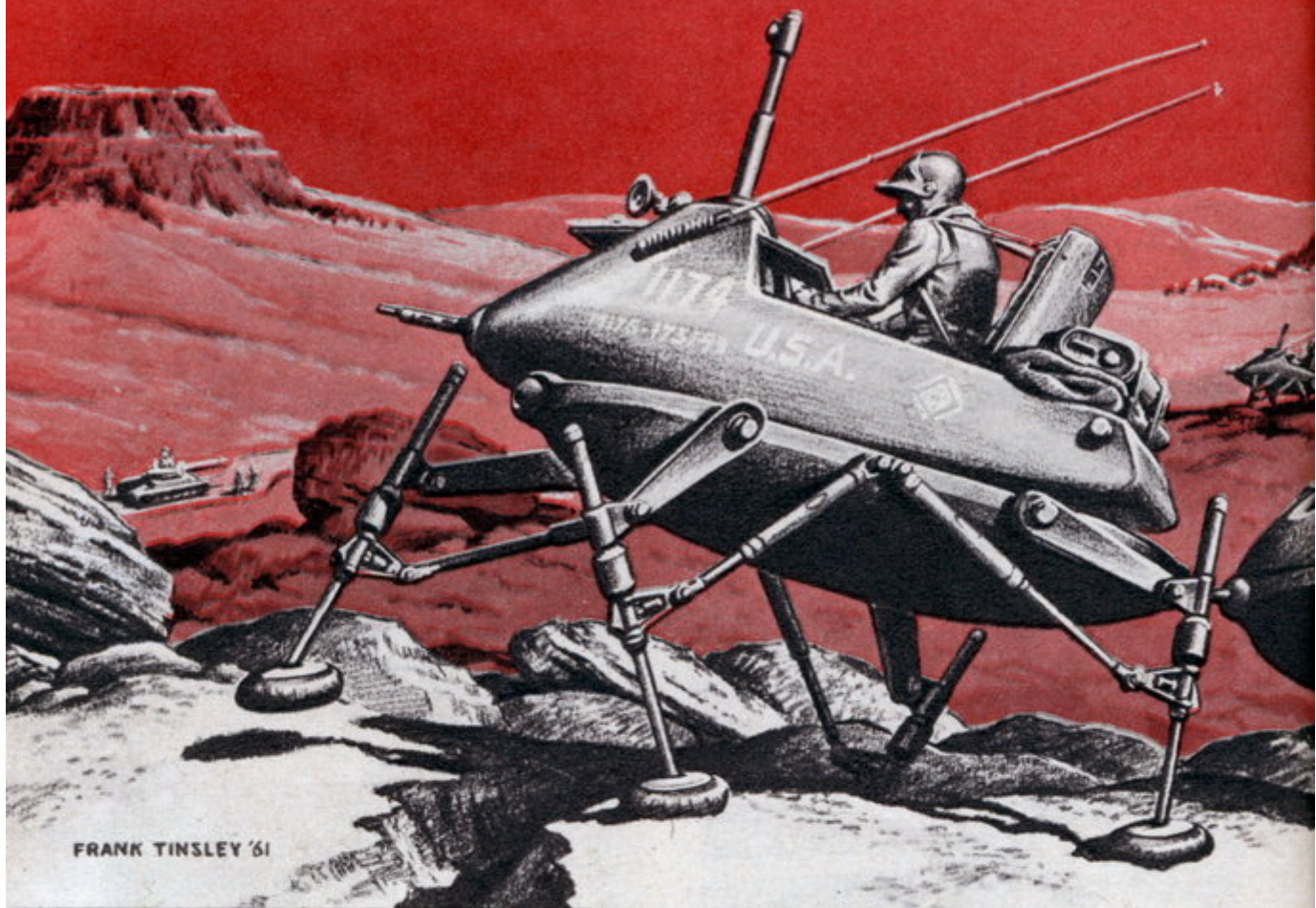
they have to last only ten minutes or so, they can be relatively light.

From the electronic standpoint, a voice bomb is a cinch. Highpower voice and music amplifiers have been used for decades. Any one of many existing units needs only to be compressed in size, fitted with battery-type tubes and manufactured cheaply of low-cost components.

Dollar for dollar of cost and effort, a one-night rain of voice bombs will unquestionably deliver more direct information to more people than a week of broadcasting by all our expensive propaganda broadcasting stations, which can count on only a very small actual audience. •

Jap balloons floated to U. S. in World War II. This paper model was found near Echo, Oregon. Photo below shows the parts: sandbags, automatic ballast device, left, and incendiary bomb, right.





HANNIBAL crossed the Alps on elephants. Future combat troops may have even greater

COMBAT VEHICLE

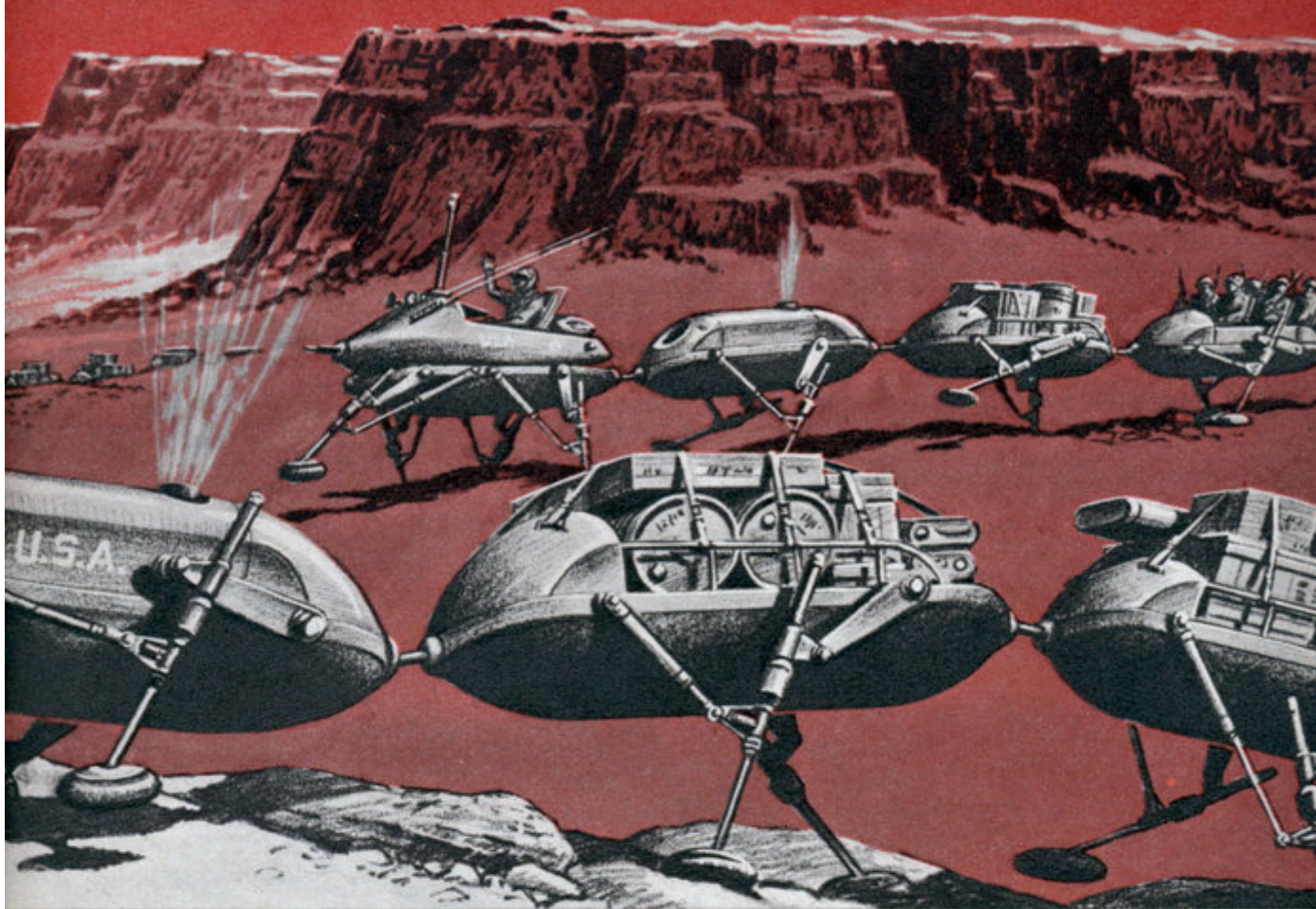
An Original MI Design by FRANK TINSLEY

IMAGINE, if you can, machines that walk—articulated mechanical “mule trains” that could thread a tortuous path through boulder fields and forests and negotiate mountain passes with heavy loads of freight. Sound crazy? Well, our Armed Forces and Space Authority are dead serious about it. Right now engineers are perfecting pilot models that are already walking around laboratories and testing grounds.

One of these devices is the solar-powered Moon Rover vehicle intended for remote-controlled reconnoitering of the moon. Designed by the engineers of Space-General Corporation, the Moon Rover will be lofted to our lunar

satellite by an Atlas-Centaur rocket. Upon landing, the six-legged explorer will unfold, raise its panel of sun batteries and, with the power thus generated, march off about its business at a brisk three mph, picking up geological samples with pincer-like fingers, analyzing them and flashing the information back to earth.

The six cam-driven legs of Space-General's moon scout are arranged in pairs—two sets in the rear and one in front—and function so that half of their number are always planted firmly on the ground. A small steering motor turns the vehicle by swinging the front legs in the direction ordered. The joints



maneuverability if our engineers' plans for a mechanical walking train become reality.

"WALKS" LIKE A MAN

of the Rover's insect-like limbs and all the machine's connecting points are self-lubricating and enclosed in hermetically sealed bellows.

An interim device, the Rover is intended to serve as a midget forerunner of later, manned vehicles. Our primary interest in Space-General's gadget lies in its use of legs for propulsion, instead of wheels, runners or the like.

An even more ambitious walking machine has been conceived by a Professor of Engineering at the University of Michigan, Joseph E. Shigley. His Army Walker has 16 legs and is designed to walk at ten mph with a man inside it. With the machine still at the experimental level of development, the professor feels that his principal task is to

increase its walking efficiency by recovering and reusing some of the power now lost in leg lifting. To effect this he is studying the power-storing possibilities of the flywheel and the hydraulic accumulator. His present thinking envisions a vehicle supported by expandable legs which are mounted in groups of four at either end of two fore-and-aft axles. At any given moment four of these legs—one in each group—will be planted on the ground; another four will be lifting for a new step; four others will be fully raised; and the final four will be descending.

MI's own version of a mechanical mule train is shown in the accompanying illustrations. Though rather more complicated than current designs, it is,

MI's mechanical walking train consists of self-propelled cargo and personnel carriers strung out behind a four-legged command unit. A gyro mechanism and self-adjusting "knees" enable each unit to maintain a level attitude over all but the roughest terrain. The control unit (left) has a pivoting, turret-type body in which the driver sits; if attacked, he closes the hatch and travels prone. The command unit is equipped with lights, periscope and a machine gun. Coupled to the command unit is the train's power pack which powers the electric drive motors. The cargo bodies (right) are mounted on two-legged subsidiary carriers whose leg movements are phased so that three pad-like feet (of two subsidiary units) are always planted on the ground when the fourth is raised to advance.



KEY: (1) Train driver in "buttoned-up" prone position. (2) Machine gun. (3) Directional spotlights. (4) Periscope. (5) Main hatch raises to open cockpit and form seat back. (6) Four-legged control unit is self-powered and can operate alone. (7) Couplings help support subsidiary two-legged units. (8) Stabilizing gyro and servo motors in each chassis. (9) Air intake and exhaust stack of gas turbine/generator. (10) Typical cargo body for the general hauling of freight.

we think, better adapted to rough terrain than either the Moon Rover or the Army Walker.

The MI Walker is an amphibious cargo and personnel carrier. Extending from the vertically orbiting "thigh" of each unit is a telescopic lower leg equipped with a depth-sensing electric eye and a pressure-activated clutch. When the Walker takes a forward step the electric eye calculates the distance to the next foothold, then automatically extends the lower leg to the required length. Once its inflated pad-like foot has been solidly placed, the machine forges ahead. As its advancing weight shifts to the outstretched leg the pressure clutch tightens automatically. The leg sequence is so phased that three of the control unit's four feet are always on the ground and form a balanced tripod base. Thus, taking long or short strides as the terrain dictates, reaching down to low-lying footholds among the boulders or up high banks, MI's Walker picks its way across the roughest topography with the surefootedness of a mountain goat.

The Walker's long, segmented body resembles that of a caterpillar. Its "head" consists of a four-legged command unit which leads the train. However, this can also be uncoupled to function as a free-walking combat unit.

Atop the Walker's hull is a tank-type turret where the driver sits, safety-belted into an open cockpit whose raised lid forms the seat back. Before him are his control grips, instrument panel, radio set and a telescoping periscope for vision over obstacles. A pair of headlights which can be individually aimed illuminate his path at night and pick out the route ahead.

In event of an enemy ambush the driver slides into a prone position, slams shut the turret hatch behind him and either shoots his way through the roadblock or takes eva-

sive action. His rotating turret-mounted machine gun makes him a formidable antagonist. Short of a direct hit by an antitank missile, he is reasonably secure.

Coupled behind the command unit is the power pack. Equipped with a midget gas turbine/generator and storage batteries, this self-contained powerhouse cooks up the electrical energy that runs the train. Its power is transmitted back through hollow coupling links to all subsidiary units, and fuel carried in each unit's reserve tank is piped to the power pack by the same route. As shown in the drawings these couplings are ball-mounted to permit maximum flexibility of movement.

Distributing the triangles of support over adjacent units permits the use of two instead of four legs for the subsidiary hulls. As in the four-legged command unit, three of the four feet of two subsidiary units are always planted as the fourth advances.

The hulls controlled by the command unit are standardized. Nested in the rear of each is a gyro mechanism to help keep it on an even keel. Forward of the gyro is a set of drive pumps that power the hydraulic cylinders which operate the legs. All hulls are watertight and designed with sufficient flotation to permit ordinary river crossings. During such passages, the wide-soled feet are alternately feathered and cocked broadside to serve as paddles.

The MI Walker is a notch or two above the rudimentary walkers now under development. However, our version is but another step in a continuing process. More rugged mechanisms and more sophisticated electronic systems are bound to emerge as experiments in the field bring more and more advances. One thing, though, is certain. Eventually man will indeed create a new form of transportation—a truly efficient Walking Machine. •

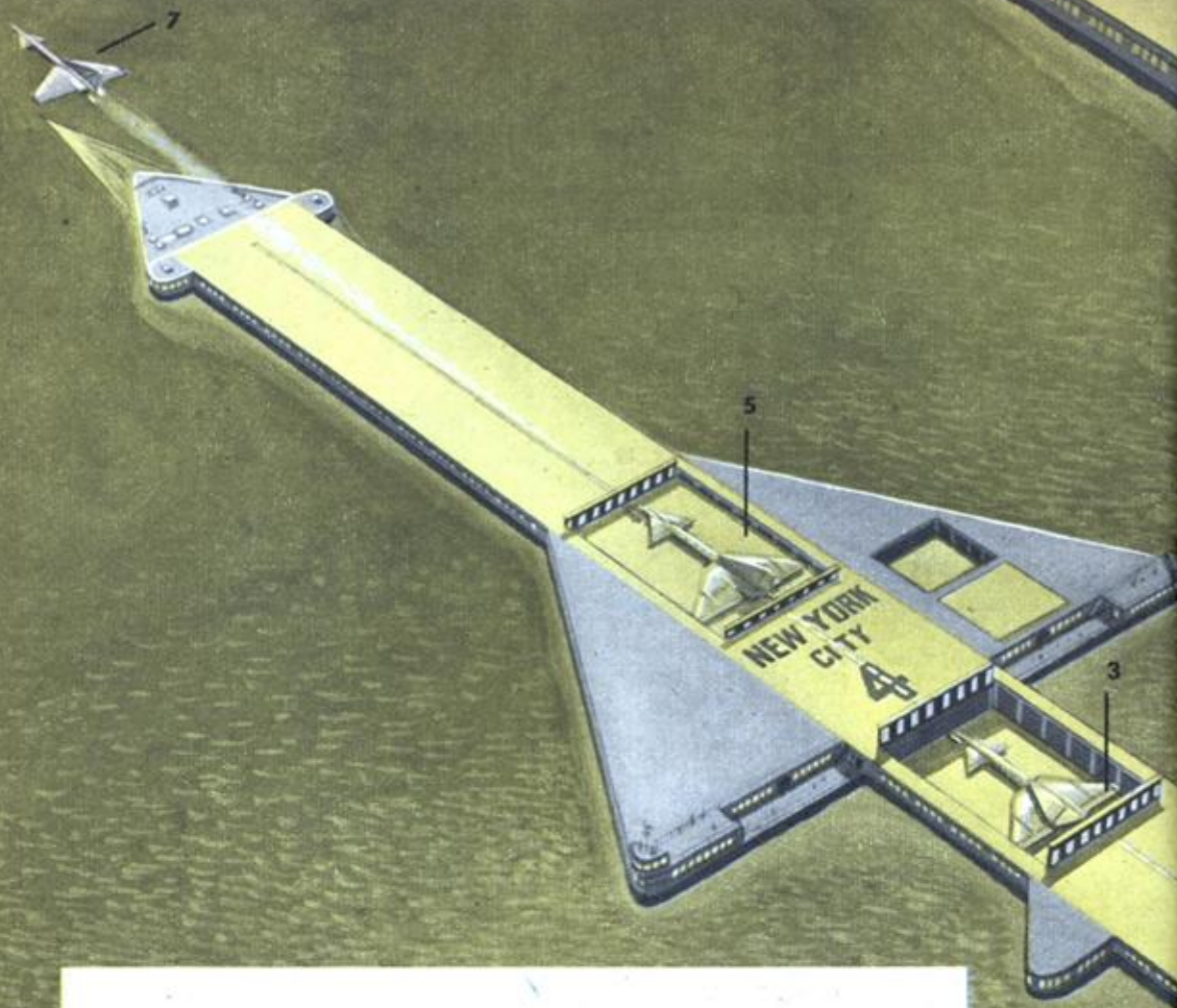
Why Don't We Build ... **FLOATING AIRPORTS**

Then when the inevitable crash occurs, it will be on open water and not a crowded city such as Elizabeth, N. J.

By Frank Tinsley

THE modern four-motored air transport is a flying fire bomb. It takes off with about 5,000 gallons of high test gasoline with the explosion potential of T.N.T. In 90 per cent of all crashes, this liquid dynamite either goes off with disintegrating force or is showered over a wide area in a flaming rain that sets fire to everything it touches. That this can be a deadly menace to people living around air- [Continued on page 68]





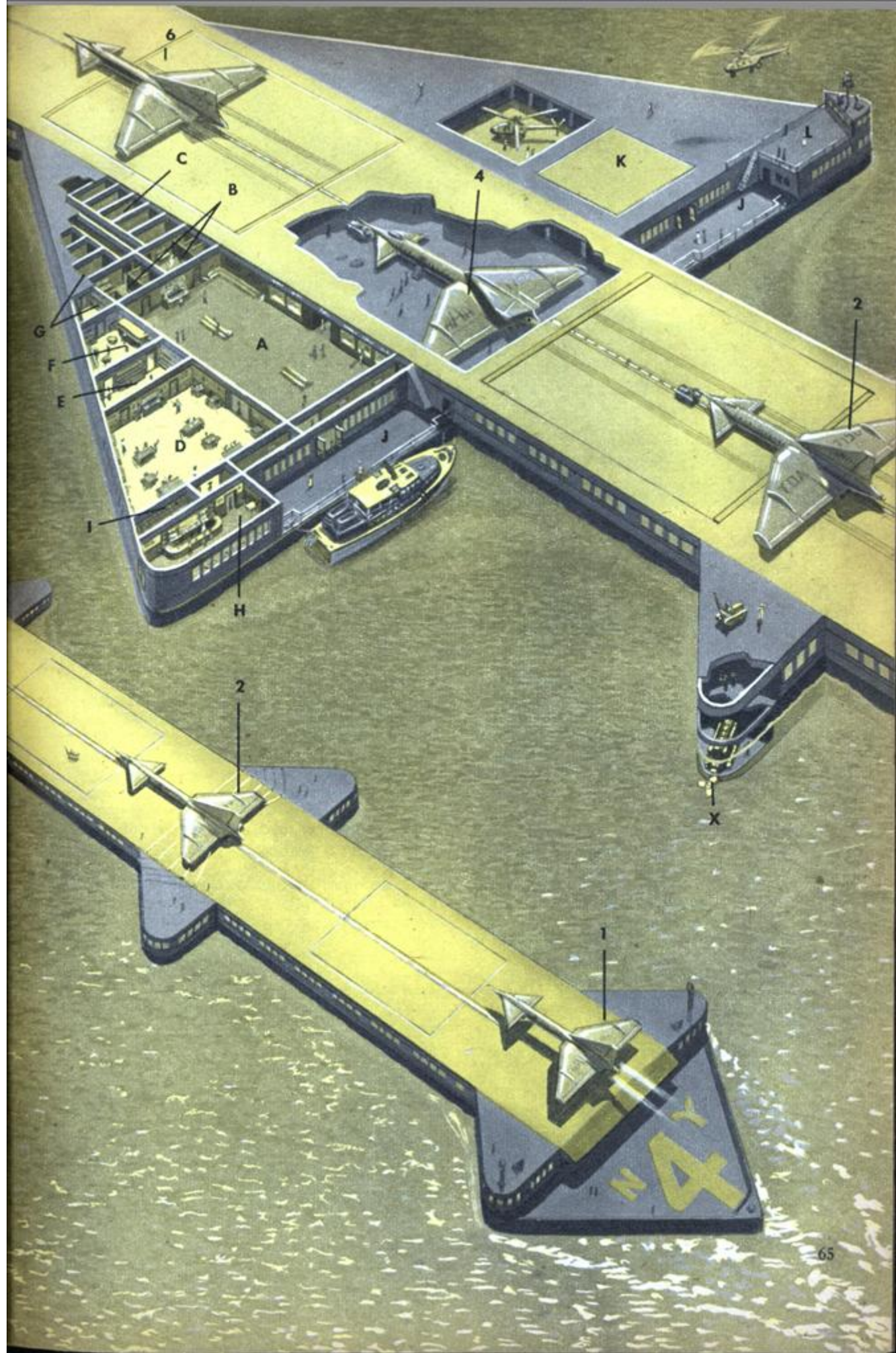
PASSENGER ACCOMMODATIONS IN CENTER ISLAND

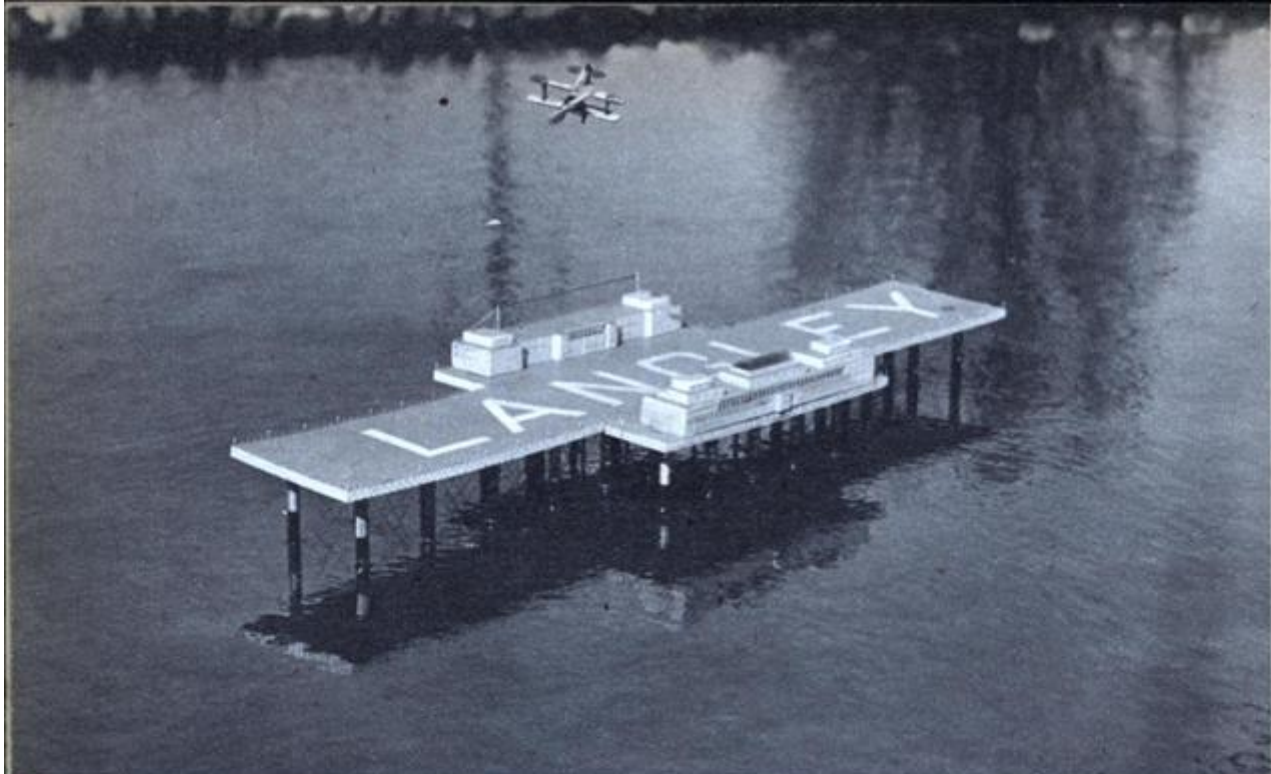
A. Lounge	D. Restaurant	G. Storeroom	J. Boat Landings
B. Lavatories	E. Pantry	H. Bar	K. Heli-taxis
C. Dressing Rooms	F. Kitchen	I. Bar Stores	L. Waiting Room

LANDING AND TAKE-OFF SEQUENCE

- 1 — Plane touches down at after end of flight deck.
- 2 — Halted by carrier type arrestor gear, it hooks to tractor.
- 3 — Towed to down elevator, it descends to hangar deck.
- 4 — It is towed forward to depot area to discharge, pick up passengers.
- 5 — Reloaded plane is towed to up elevator, rises to flight deck.
- 6 — It is towed off elevator, hooked to catapult.
- 7 — Released from forward deck, it resumes flight.
- x — Airport is kept constantly headed into the wind by automatically controlled water propellers.







Edward Armstrong of Philadelphia designed this floating seadrome before non-stop trans-oceanic flights became possible.

ports is shown in recent statistics. The Greater New York area alone has suffered five such crack-ups in a period of four months.

Through all the loud shouting about these crashes, it is interesting to note that neither the airport critics nor the airline defenders have come up with one obvious solution. Like New York, most of our great urban centers are adjacent to or surrounded by large bodies of open water. Throughout the United States bays, sounds, lakes and rivers provide a simple and relatively inexpensive answer to the problem. Floating airstrips!

*Does the idea sound ridiculous? It did when first proposed to the Allied Council prior to the Normandy invasion, but the brass was in no position to scoff at anything. Too many "screwy" ideas had already paid off. There were the British schoolboy's "degaussing cable" which countered the menace of the Nazi magnetic mine, and balloon-like rubber rafts that had saved many a pilot's bacon. Who dared to say that the notion of forming flight strips, docks and harbor facilities of interlocking, water-tight tanks might not work?

Work it did! "Operation Lily," a test seadrome 520 feet long and 60 feet wide, was given a tryout in 1945 at Lamlash, Firth of Clyde. It was formed of six-sided, steel buoyancy cans, each six feet in diameter and 30 inches deep. Naval Swordfish

planes, weighing 9,000 pounds, used them without trouble. Anchored in otherwise unusable shallow water, the airstrip was kept headed into the wind by powerful motors and it was a complete success.

Now, Ronald M. Hamilton, Lily's English designer, proposes a modernization of the plan to provide safe, floating airports for American cities. M.I.'s visualization of one is shown in the accompanying illustrations. Shaped like an arrow always pointed into the wind, the strip consists of a rigid, two-story structure supported by a flotation base of individually mounted watertight tanks.

The main structure resembles an elongated aircraft carrier with an open flight deck above and an enclosed hangar deck below. In the ends of the latter are repair and storage space for planes. Each two-plane compartment is separated from the next by an elevator shaft. Workshops and service facilities are spotted in projecting arrowhead islands along the entire length of the hangar deck.

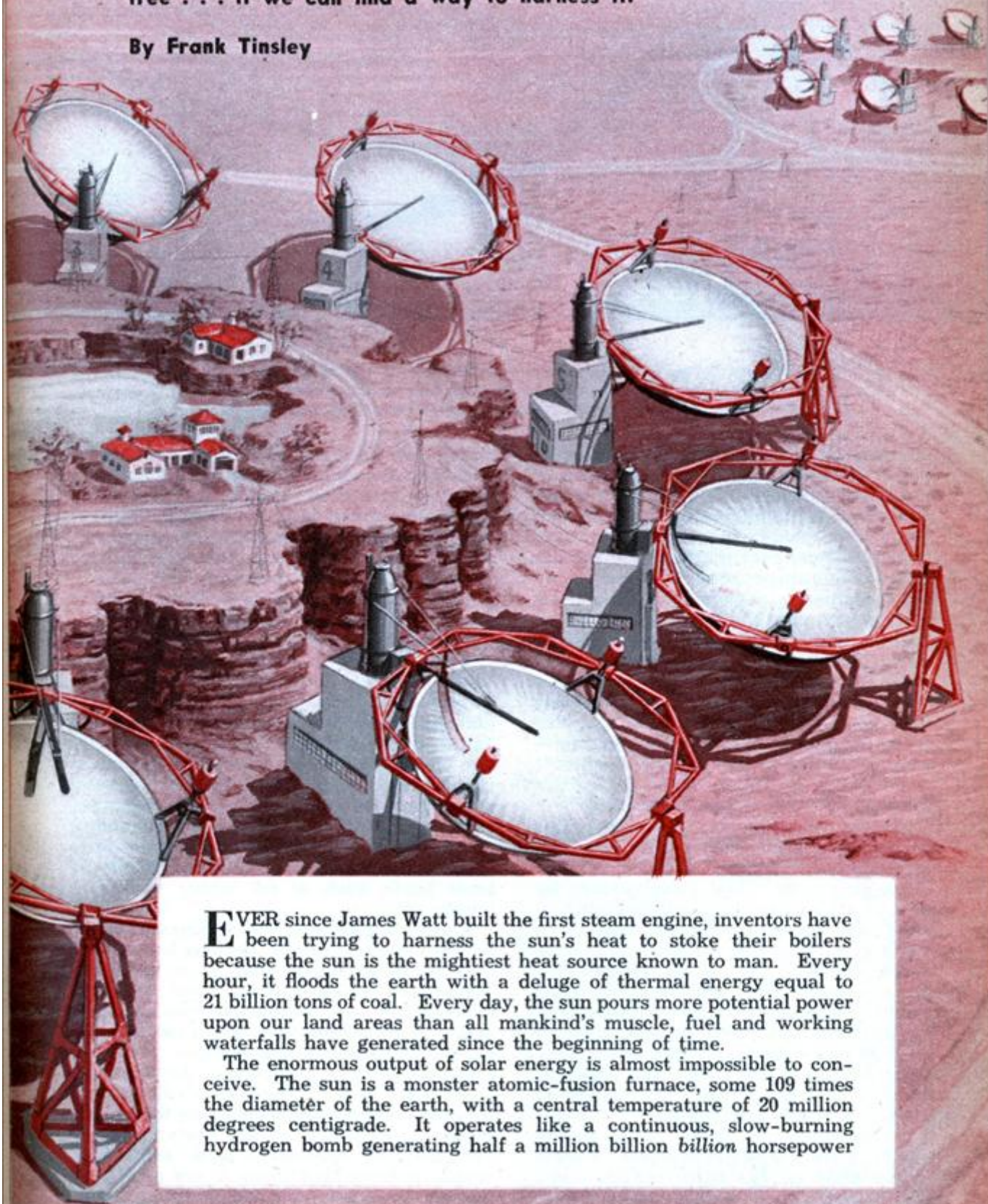
The islands also contain sub-surface engine rooms in which powerful diesels are mounted to drive water propellers. These operate automatically to keep the airstrip headed into the wind and are governed by a master wind-vane on the forward deck. The incoming plane touches down just inside the after end of the flight deck and is halted by [Continued on page 175]

Why Don't We Have... **SUN POWER**



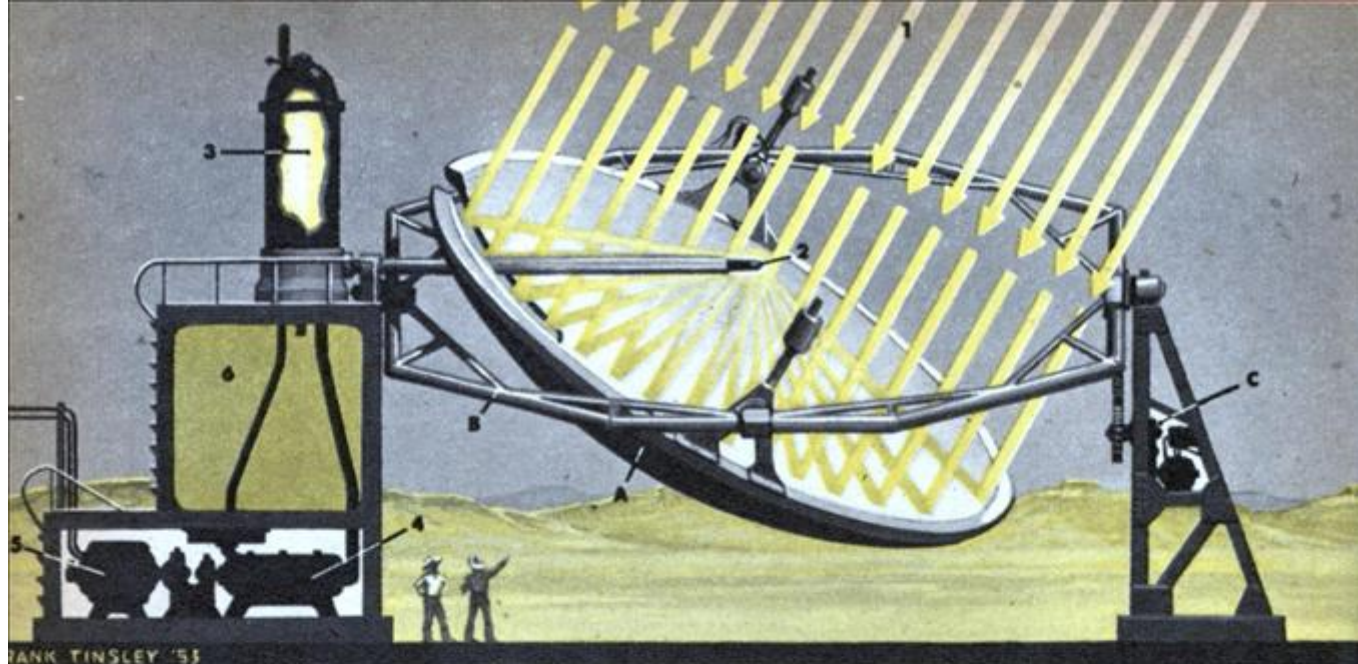
Old Sol has more energy than all the atom bombs in the world lumped together. And it's free . . . if we can find a way to harness it.

By Frank Tinsley



EVER since James Watt built the first steam engine, inventors have been trying to harness the sun's heat to stoke their boilers because the sun is the mightiest heat source known to man. Every hour, it floods the earth with a deluge of thermal energy equal to 21 billion tons of coal. Every day, the sun pours more potential power upon our land areas than all mankind's muscle, fuel and working waterfalls have generated since the beginning of time.

The enormous output of solar energy is almost impossible to conceive. The sun is a monster atomic-fusion furnace, some 109 times the diameter of the earth, with a central temperature of 20 million degrees centigrade. It operates like a continuous, slow-burning hydrogen bomb generating half a million billion billion horsepower



Abbot Solar Boiler: Parabolic mirror (A) in gimbals (B) run by clockwork (C) follows sun. Rays (1) focus on heater tube (2), turn water to steam in boiler (3). Steam runs turbine (4), drives dynamo (5), stores excess heat in chamber (6).

per second. As the sun is a sphere, this power radiates in all directions. Most of it flows out through interstellar space with only about half a billionth part of the total being intercepted by the earth. Of this tiny fraction, 50 per cent is reflected back into space by our atmosphere. The rest, partly reflected, partly absorbed by the earth's surface and plant life, is potent enough to maintain our globe at a livable temperature. If this segment of solar energy seems small, it is only by comparison for it has been estimated that if all our remaining fuel—coal, oil, wood, natural gas, etc., plus the entire supply of fissionable uranium—were set ablaze in one gigantic bonfire, it could match the intensity of the earth's solar ration for less than three days!

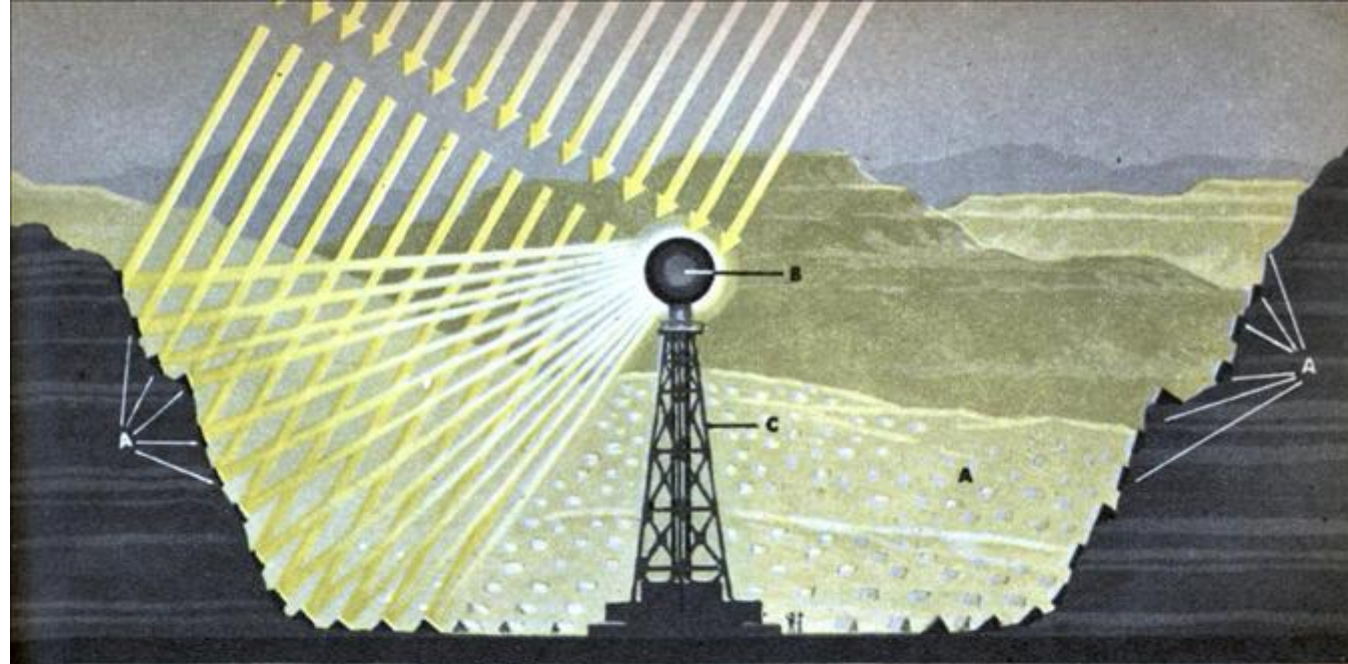
Modern experiments to harness this power have been many. The Russians claim to have generated steam at 875° Fahrenheit with rolled glass mirrors set in concrete. Later they reported building huge solar reflectors of cheap glass with plywood backing. These are said to have developed pressures of 30 pounds per square inch at 365°. They were designed for use in central Asia where the periods of brightest sunlight coincided with those of greatest power demand. In practice, they are reputed to have proven the practicability of generating steam on an industrial scale at any season of the year.

In the village of Mont Louis in the French Pyrenees, Felix Trombe, a solar engine designer, has harnessed the sun's energy in the form of pure, directed heat

which can melt or vaporize substances without contaminating them with chemical alloys or impurities. Trombe picks up the rays with a great, 40-foot square, flat mirror which turns automatically to face the sun. The rays are reflected into an equally large, parabolic mirror which acts as a gigantic burning glass, concentrating the heat into a focal spot which has reached temperatures as high as 4,500° Fahrenheit!

By far the biggest authenticated contraption of its kind, the Mont Louis reflector can melt 130 pounds of iron an hour and has actually burned holes in aluminum oxide—the fire resistant material used to line electric furnaces! In addition to important experimental work, Trombe's pure solar plant will manufacture hard-to-heat ceramics out of zirconium, thorium and aluminum oxides. These will be used to coat mechanical parts subjected to intense heats, such as jet engine turbine blades, etc.

In America, Dr. Charles G. Abbot of the Smithsonian Institution, has long been the principal exponent of solar power plants. These have been of various types. Initial experiments were conducted with single and multiple mirrors of rectangular shape, curved like sections of a cylinder to concentrate the sun's rays along the length of a tubular boiler. Later, parabolic mirrors were tested and showed twice the heat gathering efficiency of the early types. Computations and small scale working models indicate that 20 to 25 per cent of the solar energy intercepted can be trans-



Hynek's concept is variant of Abbot's. Parabolic mirrors are replaced by array of smaller reflectors (A) and are installed in field or valley to concentrate sun's rays on spherical heater (B) mounted atop a central tower (C).

formed into mechanical power. At this rate, 750 square miles of our southwestern desert could furnish all the electric power now required for heat, light, transportation and industrial purposes in the United States!

Abbot's latest model incorporates a flash boiler in which water can be converted into steam within a few seconds. The parabolic mirror is mounted in gimbals so that it can turn and tilt to follow any course of the sun. Its movements are controlled by a clockwork of the type long perfected by astronomers. It automatically compensates for changes in the sun's path over the hours, days and seasons. The mirror is assembled of concave sections of duralumin, coated with a high reflection material such as rhodium. It is mounted on trunnions and balanced with counter-weights so that very little power is required to tilt it.

The heat collection system consists of a pair of vacuum insulated, concentric tubes ending in a small, globular collector located above the center of the mirror at its focal point. A highly efficient, heat absorbing liquid such as one of the chlorinated dypenols, is gravity circulated through the tubes. It loads up with concentrated solar heat at the collector end and carries it through the tubes to a heat exchanger mounted in the supporting structure. Here the heat is transmitted to water, changing it into steam. This is piped to a turbine which drives an electric generator. Thus, the sun's rays are converted from direct heat

to mechanical power and finally into electric current.

The main problem involved is the old bugbear of mirror cost. Dr. Abbot has whittled this down somewhat by building up his 50-foot paraboloid of comparatively small segments. These, to be absolutely true and uniform, must be turned out on a mammoth press using large, expensive dies. Then the mirror must be assembled on a carefully fabricated frame requiring special jigs to accurately maintain its curvatures. [Continued on page 183]

Dr. Charles G. Abbot of the Smithsonian Institution and model of flash boiler. It raises steam in heater tube almost instantly on exposure to sun.





WORKHORSES

of the Sky

By Frank Tinsley

HOW would you like to pick up your summer cottage and move it to Florida for the winter? Or, during the dog-days of August, loft it to some cool wilderness lake? Or would you prefer to airlift your comfortable houseboat across the wilds of Canada and, in a matter of hours, set her down on one of the uncrowded inlets of Hudson's Bay? What a way that would be to spend a wonderful vacation!

Sound crazy? It might have seemed so a year or two ago but not now. The advent of a practical sky-hook, a power-packed "flying crane" built to lift and carry heavy loads, has revolutionized our ideas about transportation. Long dreamed of by industrialists, construction

engineers and the military forces, a flying towboat is now being tested at the Army's helicopter center at Fort Bragg, N. C. It is only an experimental model, put together with off-the-shelf parts of other copters. But even this preliminary model can hoist a six-ton load right out of a basket and fly it anywhere in the country.

Like the first practical helicopter, the 1939 VS-300, the new S-60 flying crane (see preceding page and the front cover) is a product of Sikorsky engineering genius. It combines the five-bladed rotor and twin reciprocating powerplants of the S-56 Marine troop carrier, with a stripped down, girder-like body. At the front end of this lifting beam is an underslung cabin for the crew and at the other, the tail surfaces and trim rotor. Completely surrounded

by glass for maximum visibility, the pilot perches in a unique swivelling seat. During the jockeying necessary to latch on to a load, he can face backward to keep an eye on his target. After take-off, he swings around and faces forward for flight. Simple—but new!

This S-60 has been a fast mover. Emerging from the assembly hangars at Stratford, Conn., in April, it headed for an Army helicopter exhibition at Fort Bragg to show what it could do. It airlifted missiles, planted rows of two-ton telephone poles and lowered 4,500-pound floor sections in place on an army pontoon bridge. Currently, it is undergoing a complete program of flight testing.

Although the S-60 provides an immediate, moderate-cost answer to the flying crane problem, Sikorsky engineers

NIGHTCLUB in the sky tours over city, suspended from a multiple hitch of flying cranes.



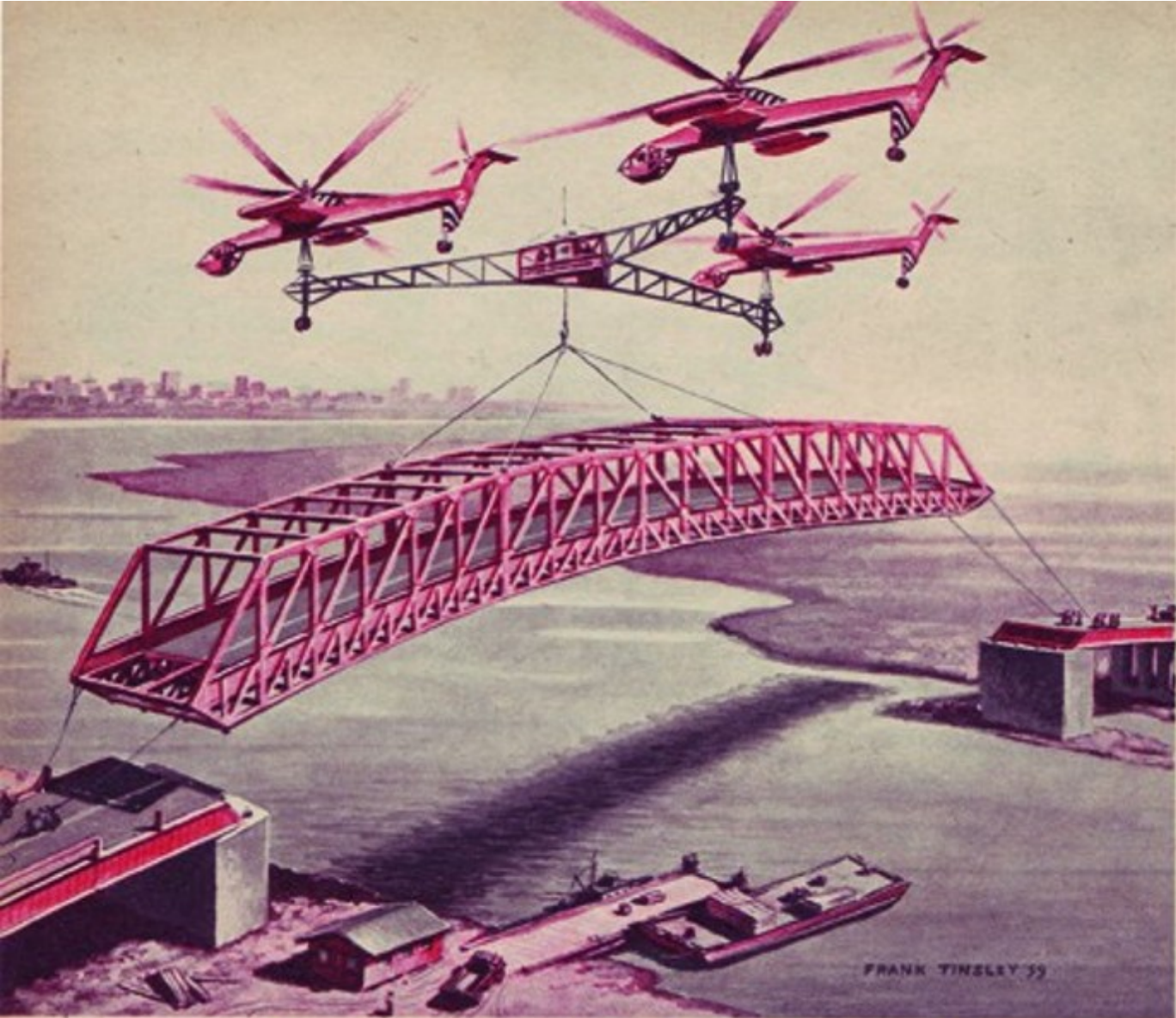


COMMUTER COPTER, designed for short haul service, has a bus-like pod slung underneath.

are far from satisfied. Far larger and more powerful models are taking shape on their drawing boards, incorporating a wide variety of forms and powerplants. Among them is a twin-boom configuration that eliminates the tail fin and wheel to permit free access from the rear. Cargo and passenger pods can be backed into position and hooked up with ease and accuracy. Various types and combinations of gas turbines are under consideration, including General Electric T-64s and Pratt & Whitney JT-12s. These high-power, lightweight engines, driving outsized six-bladed rotors, promise a tremendous stepup in lifting capacity within the next year or so. Some of the models now in the design stage are expected to carry loads up to 50 tons.

"Such machines," says Lee S. Johnson, Sikorsky general manager, "could revolutionize the transportation business." He sees the military and commercial uses of the aerial crane "limited only by man's imagination." MI's editors agree and some of these future possibilities are explored and illustrated here. Special consideration has been given to extending their prospective earning power. With this in mind, let's move ahead to 1965 and take a look at a typical day in the life of a flying crane.

The "little" 25-tonners start their daily chores in the thousands of suburban communities surrounding our major cities. Instead of the commuter heading for the railroad station in his own car, tomorrow's wage slave will pick up his briefcase and stroll to a



BRIDGE BUILDING and other construction jobs would be a simple task for cranes in tandem.

nearby street corner or road junction. There he boards a streamlined vehicle resembling a trailer bus towed by a light prime mover. It accommodates 100 or more commuters, seated three abreast on either side of a central aisle.

After a few more stops, the bus heads for the community heliport. There, straddling the take-off circles, are three or four flying cranes, each scheduled for a different midtown landing point. The bus is backed beneath its appropriate crane, locked into place and the conglomerate machine, now resembling a conventional passenger copter, takes off. Fifteen minutes later, it slants downward to a rooftop landing and the commuters race for the elevators.

Our crane can then return to the sub-

urb for later rush-hour loads or, still retaining its passenger pod, be diverted to an inter-city run. Or it may change character completely. Dropping off the pod at an outlying parking field, it could proceed to a regular construction job or be scheduled for a private hauling chore. During the spring months, for instance, boats too heavy for road trailing could be airlifted from inland points and launched at selected harbors. In the fall, they will make the return trip to the owner's back yard.

As an extension of present boating practice in which heavy power and sailing craft are shipped to distant cruise points on ocean-going freighters, tomorrow's boats can be flown up and down the coastlines in a fraction of the time. Instead of making the long water run

from Maine to Florida, or Seattle to Catalina, a privately owned or charter boat can be delivered at any anchorage in a matter of hours.

The same process applies to any heavy load. Manufactured goods, household furniture, rush shipments of all sorts, even perishable fruits and vegetables can be packed in weather-proof or insulated cargo containers and flown expeditiously to their destinations. In modern America, house moving has become a familiar phenomena, especially on the West Coast. Jacking up the usual dwelling and rolling it over the road can be a tedious and expensive procedure. Power and phone lines must be bypassed or cut, streams and railroads detoured and motor traffic interrupted. How much easier it will be to lift one's

house straight up out of its surrounding neighbors, airlift it to another community and set it gently down on prepared foundations.

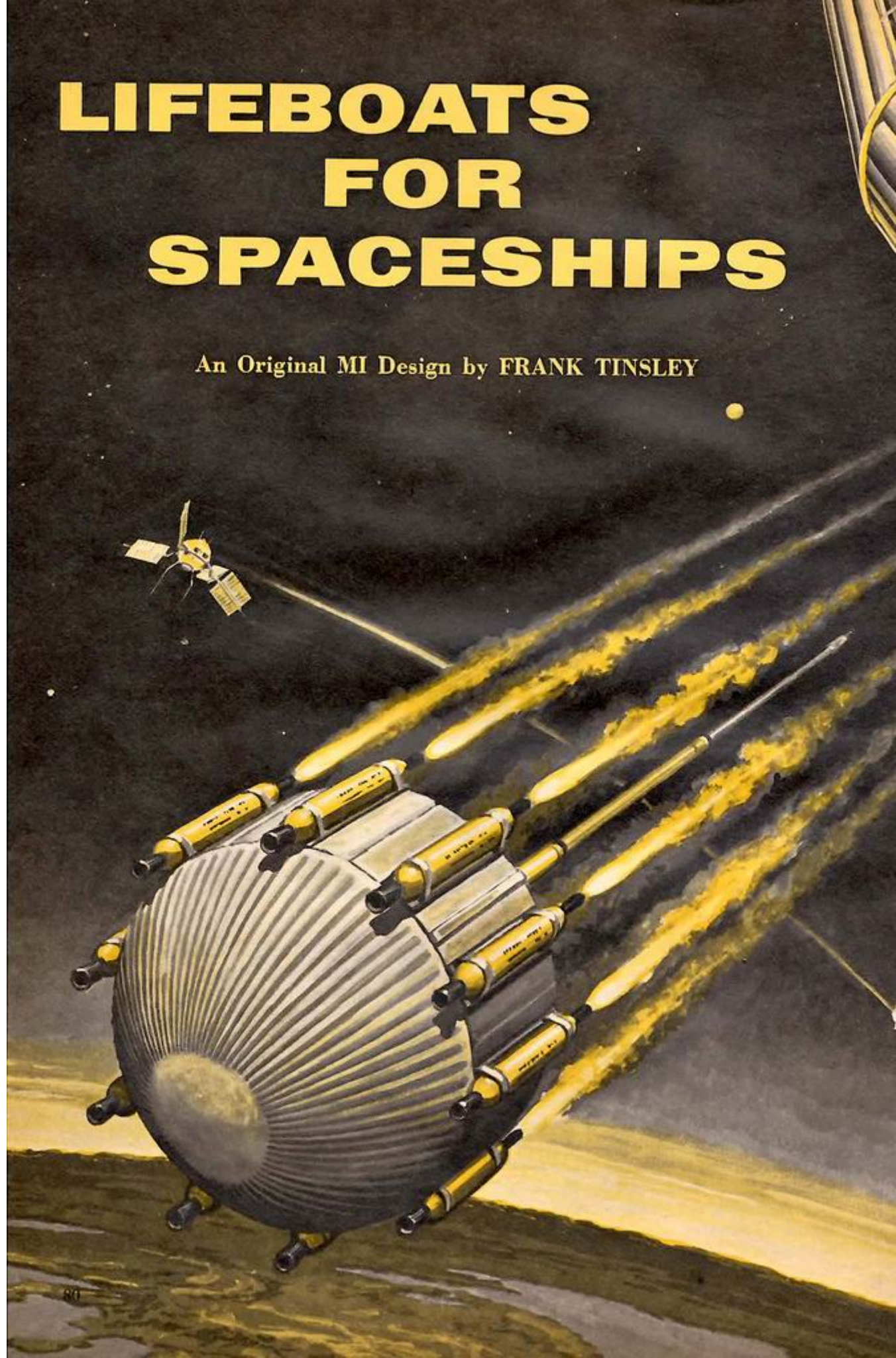
In the construction field, the copter sky-hook fills a long felt need. Even with lofty top extensions and elaborate rigging, there is a limit to the practical length of crane booms. There is also a limit to their lifting capacity, which means that steelwork must be erected in bits and pieces. Handling large sub-assemblies is obviously more economical and it is here that the copter crane can do the trick—either singly or in multiple hitches. It is not beyond the bounds of possibility to pre-fabricate a whole skyscraper floor in an outlying work yard, then to pick up the unit, complete with [Continued on page 163]

HOUSE MOVING by air-lift could result in homes made in factories, flown to prepared foundations anywhere.



LIFEBOATS FOR SPACESHIPS

An Original MI Design by FRANK TINSLEY

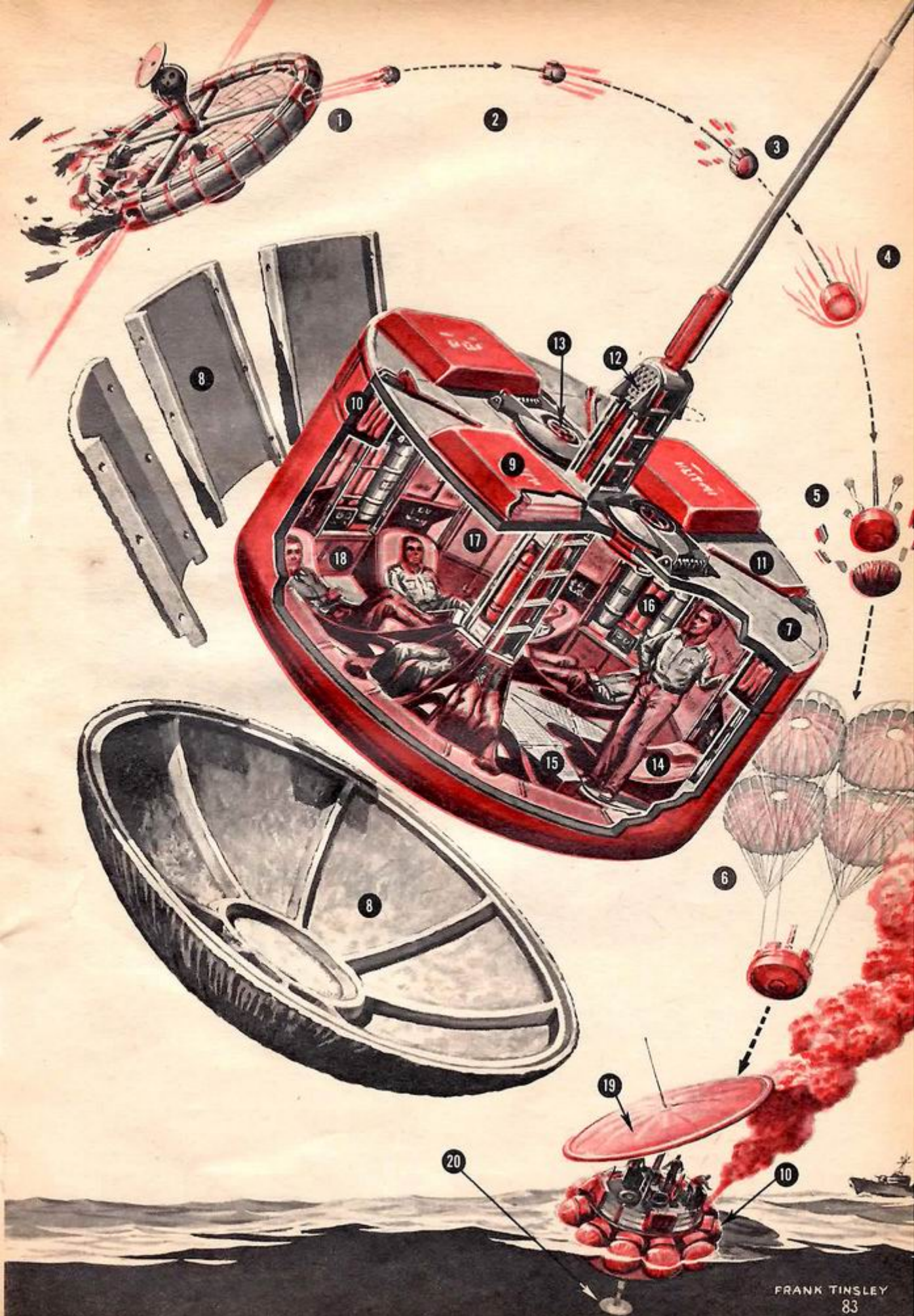




ACCORDING to the most authoritative estimates, the next 20 years will see man venturing to the moon and beyond. By spaceship, space laboratory and satellite wheels, we will explore the cold mysteries of outer space, venturing further and further as rocket boosters become more powerful and control devices more accurate.

One of the greatest dangers facing man in outer space is the problem

METEORITE COLLISION! Future spacemen in a damaged laboratory satellite or spaceship will return to earth safely in this MI-designed escape capsule.



of pressure blow-outs and meteorite collisions. So rapidly is the Space Age advancing that it is not too early to consider these dangers and how they may be met.

It seems evident that some means must be devised to save the crews of damaged spaceships and satellites and to return them to earth alive and unharmed. Such a rescue device must provide a self-contained powerplant and control system, an artificial environment, means of solving the problem of re-entry into the earth's atmosphere and a system of "soft" descent to the earth's surface.

All these requirements are met in MI's Lifeboat For Spaceships—an original design based generally on what is now known of the Mercury capsule that will carry America's Astronauts into space.

There would be sufficient space lifeboats built into every large spaceship and satellite wheel to provide for the safe recovery of the entire crew. The escape capsules are designed to meet almost any type of space damage. Consider how they would be adapted to the now-familiar space wheel or satellite laboratory:

Nested snugly in the rim of the space station, each capsule is located at the outer tip of each spoke of the wheel. The capsule's telescopic mast extends to the center of the wheel and forms a fire station-style pole for quick emergency escapes.

After the capsule has been ejected, following a meteorite collision or some other space accident, the mast extends 30 feet, functioning as a stabilizing tail—much like the stick of a Fourth of July rocket.

Nose of the escape capsule is a blunt heat shield, separated from the hull by an insulating air space. The shield

is mounted in interlocking sections and disintegrates when jettisoned. The double-walled hull, shaped like a huge coffee tin, is constructed of light metal, stressed to meet launching and landing impact and lined with additional insulation. Twin hatches cut entrance and exit time in half and there is plenty of deck space at the bottom of the ladders.

Eight shock-absorbing "acceleration beds" radiate outward from the center structure and are based on those designed for the Mercury Project. When not in use, their elevated leg rests fold down to increase the central deck space. The perimeter walls of the cabin are lined with lockers containing individual survival gear—clothing, compressed air tanks, food and water supplies. An oxygen mask hangs at the head of each acceleration bed, despite the fact that the capsule is pressurized and air conditioned. The astronauts are trained to wear pressure suits in case of mechanical failure.

The capsule is designed primarily for water landings and is completely seaworthy. An inflated parasol can be mounted atop the mast to provide shade. It also acts as a sail, radar reflector and visual spotting target and can be fitted with solar batteries for auxiliary power.

Radio, flares and smoke signals are carried as well as fishing kits, seasick pills, shark repellent and the other usual survival equipment. A four-foot tubular keel can be lowered from the bottom to steady the capsule in rough seas. Lifelines aid the watch on deck.

This cosmic lifesaver is much more advanced than any space vehicle in existence today. However, the development of million-pound thrust rockets like the Saturn points the way to future manned satellites. The cosmic lifeboat may be the vehicle that will bring them back alive. •

COSMIC LIFEBOAT. 1. Capsule is ejected from space station. 2. Retro rockets slow speed. 3. Empty rockets fall off. 4. Heat shielded re-entry to atmosphere. 5. At safe speed, heat shields drop, parachutes pop. 6. Parachutes fully open. 7. Insulated hull, mast extended. 8. Side, bottom heat shield fall clear. 9. Hatches swing up to form bulwarks on water. 10. Flotation bags inflate, form pontoons. 11. Folding stanchions help support wire life-rails. 12. Lookout platforms fold down, signal flares below. 13. Twin hatches. 14. Mercury type anti-gravity beds. 15. Leg-rests of beds fold down to give more deck area. 16. Individual oxygen tanks, masks, air purifiers. 17. Lockers with survival gear. 18. Lockers with food, etc. 19. Inflated parasol. 20. Retractable boat keel.